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Canada Geese in Yellowstone Park

By George Miksch Sutton

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THE CANADA GOOSE IN YELLOWSTONE NATIONAL PARK

BY M. P. SKINNER

WITH FRONTISPIECE BY GEORGE MIKSCH SUTTON

Dr. C. Hart Merriam, serving as ornithologist of the Snake River division of Hayden's Geological Survey of Montana, Idaho, Wyoming and Utah, mentions Canada Geese (*Branta canadensis canadensis*). A few were seen in August of 1872 in the Firehole Basin of the Yellowstone National Park. This was the first definite record of this species there; later, almost every scientist and visitor interested in birds, noted geese. P. W. Norris, then superintendent of the Park, reported in 1881 that these geese were abundant and that they "hatched their young in vast numbers," especially at the south end of Yellowstone Lake. In 1898, Capt. James B. Erwin, then acting superintendent, thought probable that some Canada Geese remained in the Park all winter. Dan Beard wrote in 1901 of their extreme tameness. In spite of these early notices that Canada Geese were present, no prolonged or more definite studies of their lives have ever been made. Including every reference that I can find on this bird in the Yellowstone Park, all the material published before this, including two pages written by myself, would cover only about three pages of the WILSON BULLETIN. Most of this material is widely scattered, consisting, as it usually does, of but a mere mention, or not more than two or three sentences together in any one place.

The Yellowstone National Park is a high, mountainous area about sixty-two miles north and south, by fifty-five miles east and west. Included in this area are hills and valleys, broad plateaus, and mountains extending up to 11,125 feet above sea-level. Being elevated, even its lowest altitude is over 5300 feet (or just a little over a mile) above sea-level. Not only is it diversified in altitude, but its features are varied. They include open, grassy meadows; rugged, rocky hills; desert areas covered only by sage-brush; delightful valleys and hills whose carpet of green grass and herbage is dotted here and there by groves of trees; and rolling hills and plateaus covered by

dark, somber, coniferous forests stretching away as far as the eye can see.

The lowest elevations are treeless, except along the larger streams. Perhaps a little of this area is in the Upper Sonoran Zone. Possibly Canada Geese do not nest, because there are no suitable places, in the Upper Sonoran Zone inside the Park, but other Canadas nest below the Park in what is unquestionably Sonoran. Inside Yellowstone Park, some Canada Geese breed in the Transition Zone, but many more have their nests in the much larger Canadian Zone. Presumably the great number of ponds, marshes, and lakes in the Canadian Zone attracts many geese there that might otherwise nest lower, in the Transition. I have never found a Canada Goose nest in the Hudsonian Zone in the Park, but there are really very few suitable localities there.

Such an elevated region as the Park, naturally attracts and catches moisture that falls as rain and snow and sinks into the ground, or flows off in a myriad of small streams eventually uniting into several larger rivers that rush away in all directions. The Madison River dashes west until it swings to the north to form the head of the Missouri River; the Yellowstone River runs north through the Park until it changes its course to northeast and later becomes the main tributary of the Missouri River; various mountain streams flow east to fall into, and largely make up, the Bighorn River; and the Snake River surges south and later swings west and north to become a big part of the mighty Columbia River. In fact, the elevated Yellowstone region is the fountain head of many important rivers of the United States. In addition to those already mentioned, another large river (the Colorado) rises a few miles south of the man-made southern boundary and flows south into the head of the Gulf of California.

What wonder, then, that this generous rainfall not only causes an elaborate, interlacing system of running streams, but also forms a multitude of small ponds and larger lakes! Of these, Yellowstone Lake is the largest, covering an area of 140 square miles. If this Lake had a compact, regular shape, its shoreline would be only about forty miles in length. But it is actually so irregular, and has so many islands, inlets and sheltered bays, that its shoreline is really more than one hundred miles in length. Those islands, crooked inlets, and cloistered, sheltered bays are beloved by the Canada Geese and probably afford the reason that so many of these birds live there.

But this big lake is not the preferred home of most of the Yellowstone geese. By far the larger proportion live on other, and smaller,

members of the intricate surface-water system. Scattered throughout this well-watered wilderness of thousands of square miles, the Canada Geese find many small, secluded lakes and water courses near which they like to nest and raise their youngsters. They are found almost everywhere in the Park where there is water; on marshes, sloughs, ponds, lakes, streams, and meadows. They are fond of resting, both day and night, on the sand and gravel bars, the points, and the beaches of Yellowstone Lake and the larger rivers; and also on the mud bars, points, and flats extending down into the water until they may be actually covered. On cold days the geese seek shelter under protecting banks, or bask in the comparatively hot sunrays of these high altitudes, on gravel and sand bars, often going to sleep while doing so.

These big birds really seem to like to be with their fellows, and when the work of raising their young is over, they are almost always in small flocks. Usually these are family parties, but quite frequently these smaller groups unite into larger flocks. Canada Geese never fail to astonish the visitors to the Park, especially those that already know them. Elsewhere, geese are considered the essence of wildness; in the Yellowstone, under absolute protection, they are the most readily tamed of all birds. Elsewhere, shot at and harried until they are the wildest and wariest of birds; here, they are tame and fearless to a truly astonishing degree. It really seems as if the wisdom and sagacity that makes them so difficult to outwit where man is their enemy, leads them to realize the quickest, that here in the Yellowstone, man protects them and wants to make friends with them. Certainly, they are tamer than most of the ducks. In a way, this only bears out similar observations elsewhere. For, wherever we give birds, or other animals, a chance to be friendly with us, they always take advantage of it. And always, it is the wisest and the wariest that realize quickest where there is sanctuary for them.

Still, with all their trusting, friendly ways, these Park Canada Geese do not want man to become too familiar with them. They do not mistrust bird-lovers, but, on the other hand, they do not like to be pursued. When a pursuer is in a boat, the geese are apt to fly away, or go ashore, when too closely approached; but if the disturber is on shore, they fly out on the water, or often cross the water and climb the opposite bank. When they decide to escape by stream, geese are wise enough to let the current carry them downstream, instead of attempting to escape by swimming upstream, and losing time battling the current, as so many ducks are apt to do.

When Canada Geese are really alarmed, they begin their loud, clarion cries, warning all others within hearing and finally flying swiftly away, honking loudly as they go. In fact they keep up their alarum until they are satisfied that all is again safe. When they come in to alight, they often fly to and fro to see if their intended landing place is free of enemies. If alighting on a small pond or lake, they may circle again and again over it until they have given their sharp eyes ample time to survey the waters and the shore below.

Sometimes, Canada Geese, especially if they think they have been unobserved, try to escape discovery by lying low with head and neck outstretched upon the ground or along the surface of the water. If on a stony beach, the birds look like dull gray cobble stones and the deception is perfect; if upon the water, the birds look like dead bodies idly rocking on the waves; but if they are on green grass, the geese's acuteness plays them false, for their color is then contrasted with the green and they are very conspicuous. They will sometimes crouch in this way for an hour, never moving more than perhaps an eyelid until the intruder is a hundred yards away. Then the heads are slowly lifted, followed by the necks, and finally the birds rise to their feet again. I have even seen some Canada Geese carry this farther by swimming the Yellowstone River with heads and necks outstretched along the surface; and again I have seen them try to sneak off through the grass in the same way. These subterfuges are used more in the spring than in summer, but are practiced sometimes in September and October. Quite often a brooding bird on her nest, will seek to escape being seen by stretching her head and neck down along the sides of the nest, and, when she does so, she gives herself a most un-goose-like appearance.

Canada Geese are often seen with other birds such as: Mallard (*Anas platyrhynchos*), Green-winged Teal (*Nettion carolinense*), Cinnamon Teal (*Querquedula cyanoptera*), Baldpates (*Mareca americana*), Pintails (*Dafila acuta tzitzihoa*), Canvas-backs (*Marila valisineria*), Redheads (*Marila americana*), Barrow's Golden-eyes (*Glaucionetta islandica*), Mergansers (*Mergus americanus*), Whistling Swans (*Cygnus columbianus*), Grebes (*Colymbus nigricollis californicus* and *Colymbus auritus*), Coots (*Fulica americana*), White Pelicans (*Pelecanus erythrorhynchos*), and California Gulls (*Larus californicus*). The geese and most of the ducks really appear to like to be with each other more than the ducks do with other species of ducks. I know I have often observed these geese with many different species of ducks on days when it was impossible to find two or more species

of ducks together. The association of geese with grebes, coots, pelicans and gulls seems characterized more by indifference and tolerance on the part of the geese toward these other birds, probably present because of a liking for similar food, or similar habitat.

These big Canada Geese are so wary and difficult to catch that they outwit most of their enemies. Because outwitting them is such a task, the bears and most other of the carnivorous animals let the adult geese alone. But coyotes, mink and skunks get a few of the goslings at times. Geese, even young ones, show no fear of even the

Canada Geese on the Yellowstone River

biggest of the hawks flying over, or near them. I have seen the great Golden Eagles swoop at geese, but never saw them catch or kill one. Even the coyotes, wisest of all mammals, seldom undertake the task of catching an adult goose, much as they would like good, fat ones. And yet, I was once very much amused to see a coyote try to stalk a small flock of full-grown birds. He must have been either very young, or else somewhat simple-minded. The geese were perfectly aware of what was going on, and might well have chuckled to themselves as each long, cautious crawl of the coyote found them just a little farther away and entirely too far from cover to warrant a rush. But the coyote was persistent and the geese apparently had nothing better to do than to amuse him. Two or three hours passed in labo-

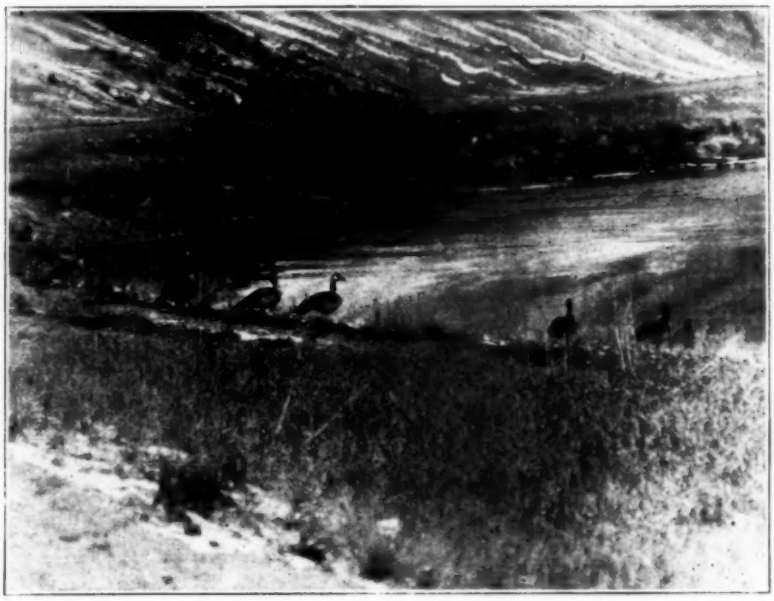
rious efforts, and perhaps much canine swearing, that were all equally unfruitful. At last, patience gave way in one mad rush across the beach, only to have the exasperatingly calm geese enter the river and swim away about two jumps ahead.

They fly well, but being heavy birds, Canada Geese are compelled to rise against the wind. On the land, they run a few steps before they can rise; on the water, they kick the water behind them for the first few wing strokes; but on a bank, they can jump out and down to obtain the necessary starting speed. Although the start seems so laborious, once the geese are in the air, their flight is strong and powerful. As a rule, they fly some distance above the surface of the land or water, but occasionally I have seen them flying across the broad expanse of Yellowstone Lake, just skimming the water.

"Honking" by Canada Geese may denote alarm, greeting, or anxious seeking of a mate. It may even seem at times like the mere sociable calling of one bird to another. According to the mood of the hearer, Canada Geese may be either very noisy or sweetly musical. When the hearer is tired, the honking of an old gander awakening down on the meadow at three o'clock dawn, is just plain "noise"; but when the honking is of distant, migrating birds at the end of a long and dreary winter, it is a "welcome, musical, harbinger of spring". Once, when I was battling in a small boat on Yellowstone Lake with a fierce snow squall that threatened to engulf me, I thought the honking of the geese revealing my previously unseen landing place, the finest, as well as the most welcome, of musical sounds.

While the great majority of Yellowstone geese spend only the summer there, quite a few remain all winter upon waters kept open by swift current, and even more upon the waters freed from ice by hot water from the hot springs and geysers. It seems very wonderful, where the temperature of the air often goes far below zero, that there should be natural hot water enough to keep even such large streams as the Madison, Snake, and Yellowstone Rivers free from ice. But such is actually the case, and many Canada Geese remain all winter to take advantage of these open waters. There are even a number of meadows so underlaid by warm springs that the snow is melted, and even a little green grass grows there all winter, to be greedily devoured by the geese that relish the unexpected, because unseasonable, treat! The migrating birds commence to arrive in April with the first thawing of the snow, increase rapidly in numbers until May fifteenth, and then gradually decrease during the next thirty days. During the time they are present the meadows are alive with Canada

Geese and the air resounds with their silvery "honk-ah-honk". Then those geese that go north, depart, and only the birds that breed in the Park remain behind. But even so, Canada Geese are fairly numerous throughout the summer, for probably as many as four hundred pairs nest each year within the limits of the Yellowstone National Park. The return migration from the north begins to arrive very regularly about September tenth, reaches its height forty days later, about the time the smaller lakes freeze, and then declines. The winter residential number of Canada Geese is about two hundred, although varying widely in different years.



Canada Geese Picking Gravel on the Yellowstone River

The Canada Geese that arrive in spring, often get there so early that few of the ponds are open. Indeed, I have actually seen geese on the frozen surfaces seemingly waiting for them to open! Before the ice, itself, melts, the snow water comes rushing down on the still frozen ponds and gives the earliest wildfowl a bit of their chosen element. They do not stay long on these first waters, but move to the next to open, and repeat, so that they are most numerous on ponds where water is just appearing. It is interesting to see the geese climb up on the rotting ice. Generally they fly, but occasionally one *swims up* by forcing itself forward over the breaking, mushy edges until its breast finally slides up on the still firm part of the ice. After the

mating season that follows, is over, the pairs scatter to their chosen homes. In September the geese begin gathering again on the larger waters, to remain until the gradual advance of heavy frost drives them south once more.

Canada Geese eat a variety of foods and, naturally, have a variety of ways of getting it. In April, the streams and ponds swollen by melting snow are covered with many delectable seeds and early insects. In May, the meadows furnish a rich feast of fresh grass and grasshoppers. Here, the geese, both adult and young, stay all day at first, but later come every evening to feed, and then leave after dark, for they prefer to seek the safety of open water for the night. Geese are great eaters of grasses and of the roots of grasses. In fact, grass is one of their chief articles of diet when it is to be had green, but they also eat many seeds and much small grain. They can exist on a vegetable diet, but in summer, they eat a great many insects also, as well as other animal food (I have even found them far away from water, out in the sage-brush, hunting locusts), changing again to vegetable food as autumn advances. During the latter season they feed on the water, "tipping" very much as Mallards do, or merely swimming along where the growth of water plants is near the surface, with their heads and necks underneath, gleaning what they can reach as they go. In May, and still more in the fall, they seek out the main traveled roads for gravel, and sometimes for spilled oats. In October, they dabble in springs, apparently for the small, tender plants that grow there. After eating, Canada Geese are apt to fly to some sand, or gravel, bar to preen and bask in the warm sunlight. Sometimes they take a bath before preening. This they do in the warm, shallow water at the edges of sand bars or flats, making a great splashing with their fluttering wings.

What would pass for courtship with other birds, occupies most of April; but geese are believed to mate for life. Still, the young, unmated birds each year outnumber the older, mated birds, especially as the young birds do not usually mate until they are two or three years old. So there is actually a great deal of courting each spring. And perhaps even the older pairs renew their youthful courting at each recurrence of the magic season. Certainly, at this season, all the Canada Geese are very uneasy and noisy, but by the time nesting begins, they all quiet down once more.

The paired geese appear rather particular (from their point of view) about their nest sites, and do considerable searching before selecting a spot. But after they have made a selection, they may, and

usually do, return to it year after year. They may decide on a place that seems very prominent indeed. Low elevations, such as the tops of muskrat houses, and especially beaver lodges, are preferred; but sometimes the top of a boulder, particularly if the base is surrounded by water, is chosen. For several years, there were a pair of geese nesting on the top of a bare and prominent boulder in Gibbon Canyon, and only a few feet from the heavy traffic that flowed so steadily over the loop roads of the Park. More rarely, an old osprey or hawk nest is occupied. If nothing better is found, a pile of dirt or mud, if surrounded with water, will do. The word "nest" is rather a misnomer; usually the geese utilize whatever grass and trash may be on the nest site already, although they almost always add down from their breasts. Nesting time is irregular, the first of the four to seven pale green eggs being laid during the last of April, in May, or even in early June. The gander usually stays near his mate to help defend the nest, and is capable of striking powerful blows.

The goslings are hatched in May, or during the first half of June. When they leave the eggs, they are covered with soft yellow down. They remain in the nest only until they are dry and then leave it forever. All through their callow days they retain their natal yellow down, but they are expert swimmers even then. I have seen them on Yellowstone Lake in quite stormy waves, when only two weeks old, bravely swimming in a line exactly following their parent-leader. Both parents take care of the youngsters, often leading them through the meadows. While their feet are not well adapted to walking on land, the goslings can walk and run quite rapidly; but not fast enough to evade their enemy, the coyote, that no doubt catches many before they can fly. Goslings are not fully grown and able to take care of themselves until two months old. Even after that, the whole family stays together, usually until the following spring.

After the young are a month old, the parents begin to molt. At this time, the ganders resort in large flocks to small undisturbed lakes, where they remain three or four weeks, until about July twenty-fifth, when their new flight feathers are strong enough to bear them back to their mates and little ones that have stayed together, for the female molt is not as severe as the ganders'.

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JAMESTOWN, N. Y.

BOB-WHITE AND SCARCITY OF POTATO BEETLES

BY E. L. MOSELEY

For more than ten years Ohio has protected Bob-white with a closed season, and a great increase in the numbers of these birds may be seen. If we may judge the abundance of the birds by the frequency with which they are observed by human eyes, we would say that Bob-white is now fully twenty times as numerous as when there was an open season. These birds have, however, not only multiplied, but have become so tame that they do not take the trouble to keep out of sight. The apparent increase may be due, therefore, as much to their tameness as to their actual increase. Students in my classes have come to the State Normal College from all counties of northwestern Ohio, and also from other parts of the State. Not one among them knew of any county where the Bob-white had failed to increase in recent years. Most of them would not attempt to estimate the extent of increase; some thought tenfold, others two, three, or fourfold.

For several years past potatoes have been raised successfully on many farms in Ohio without spraying for beetles, or taking any measures to combat the insects. In fact many patches have been practically free from the "bugs." I have never known of the potato grower being so fortunate in previous years. For more than half a century the Colorado potato beetle has been a very serious pest wherever potatoes were raised. Why it should disappear I could not explain. I had wondered if ladybirds, which fed upon the eggs of this beetle, had multiplied; or if some other enemy was holding it in check. The Rose-breasted Grosbeak is so uncommon here that few people ever see one. A captive mole which I fed for some time would not eat potato beetles, either larvae or adults. These insects are not relished by all the birds and mammals that greedily devour white grubs and grasshoppers.

Last year while cutting weeds on the farm where I had first noticed the scarcity of potato beetles, I discovered a Bob-white's nest near the potato patch. I reflected that these birds had probably found breeding places and been numerous near this potato patch for several years. In the city of Sandusky, where Bob-white is presumably uncommon. I had helped a friend in gathering hundreds of beetles from his small patch of potatoes. I decided to make further observations and inquiry.

Close to the much-traveled Chicago Pike I noticed a potato patch badly infested with beetles, while other potato patches which I examined showed few or none. Most of the farmers I talked with reported seeing few potato beetles in recent years. So I enlisted the help of my students in making further observations and inquiries. Below is given a summary of the information thus collected.

Bob-whites have been observed to spend much of the time among the potato vines.

They have been seen to follow a row, picking off the potato beetles.

When the potato patch was located near woodland there was no trouble with the beetles; but when the patch was near the highway or buildings, even on the same farm, the insects were troublesome.

On farms where the Bob-white found nesting sites and protection, the potato vines, if not too near the buildings, were kept free from the insects.

A patch of potatoes surrounded by open fields, without bushes tall weeds, or crops that might shelter the Bob-white, was likely to be infested with beetles.

A farmer living eight miles south of Defiance raised about fifty Bob-whites on his place. During the two years that these birds were there he had no trouble with insects on either potatoes or cabbage. The following autumn a number of the birds were killed by hunters, while others were frightened away. The next summer the potato beetles were back in numbers. The farmer is again raising Bob-whites and protecting them from hunters.

A student coming from Potsdam, in northern New York, reports that they have no Bob-whites, and that potato beetles are plentiful. Another report from western Pennsylvania, where the Bob-white is not as plentiful as in Ohio, potato beetles are still very numerous. E. H. Forbush wrote me from Massachusetts as follows: "When the Bob-whites were most plentiful on my farm they kept the potato beetles in check, so that we did not have to spray at all; and I have heard of several other similar instances."

More recently I have learned from A. F. Conradi, General Manager of the Southern States Chemical Co., Birmingham, Alabama, that in the truck growing regions of the south a greater quantity of arsenical spray (calcium arsenate) is used for potato beetles than for any other insect. He also states they have an open season for shooting the Bob-white.

It has been suggested that this evident scarcity of potato beetles may be due in part to the work of the Hungarian Partridge. It is true that these imported birds have become common on many Ohio farms, and some credit may be due them. But the Bob-white is much more generally distributed, and its habits are much better known: and we are much more inclined to regard this species as the principal cause of the recent scarcity of the potato beetle in Ohio.

State Normal College.
Bowling Green, Ohio.

CHIMNEY SWIFTS IN NOVEMBER, 1925

BY OTTO WIDMANN

As it is universally understood that the last Chimney Swift leaves the United States by the first of November, it was a great surprise, when on the afternoon of November 6, 1926, I saw eight swifts hunting up and down low over trees and houses in an outskirt of St. Louis, like in summer. My surprise would not have been so great, if an ordinarily mild October had preceded, but at the end of October and the first two days of November we had seven days of freezing weather. Once (October 30) the temperature was as low as 21° here in the city, and 16° in the county—the lowest temperature of any October day in sixty-two years. The weather was warm on November 3, 60°; on November 4 and 5, 58°; and on November 6, 56°; but where had the swifts been during the freezing days? They could not have found any insect food and probably had spent these cold days and nights in a warm chimney. Passing a week later the same way where I had seen the swifts on the 6th, I found that a high chimney had been built for a parochial school (Santa Rita) in course of construction. This was probably used for a roost, a most suitable place, because fireless and closed at the bottom, therefore draftless and warm. While I saw only eight swifts at three o'clock in the afternoon, there may have been hundreds coming to the roost in the evening, as I was not the only St. Louisan who saw swifts at that time.

In reply to a letter Mr. Luther Ely Smith, President of the St. Louis Bird Club, wrote me: "I recall very vividly on the afternoon

of Saturday, November 7 (a very rainy and dismal afternoon) being at Francis Field at Washington University to witness the Washington-Missouri football game. During the game something like two hundred toy balloons were released from time to time and they made a very pretty sight as they went up in the air. I was particularly impressed because the swifts that were darting about the sky continued their movements apparently quite scornful of the invasion of the army of color in the shape of green, red, and blue balloons that were marching through the sky. The incident and the unusual occasion fixes the date of these particular swifts in my mind."

Miss Jennie F. Chase, Secretary of the St. Louis Bird Club, wrote me on November 9, 1925: "I am glad to be able to contribute one tiny item to your swift story. Early Sunday morning, the eighth of November, I saw one swift from my window in Kimmswick—just one. There may have been more about, but I could not follow up the search."

The *St. Louis Times* of November 14, 1925, had the following article with the headline: "500 Swallows Found Dead in Alton Furnace"—"More than 500 dead swallows were carried from the furnace and bottom of the chimney at the house of Miss Alice Whiteside in Edwardsville, Ill., before the fire would burn. The swallows are believed to have entered the chimney several days ago and after two days of bad draft on the furnace the chimney was examined."

Mr. T. E. Musselman, of Quincy, Ill., who trapped swifts for banding, has the following to say about the unusually late presence of swifts in 1925 (Wilson Bulletin, June, 1926, p. 121): "In 1924 the last swifts departed for the south on October 17, but the last date in 1925 was one month later to a day. In 1925 few swifts were seen about town during the day time after the middle of October: but at dusk as many as five or six hundred circled over the favorite chimneys and it was at this time that I secured my largest catches. Colder weather appeared and I discovered that on days when the thermometer indicated an approach to the freezing point the birds remained in the chimneys until about nine o'clock in the morning. During the daytime the birds quickly returned from their feeding over the river, circled but a time or two, and dropped into the chimney until warm. . . . But the most popular chimneys were those which connected below with the basement and served, therefore, as warm air flues. In such chimneys the temperature reached 70°. Little wonder that the birds preferred these chimneys on damp and cold nights! On October 28 a severe snowstorm forced the swifts into the chimneys. The next morning at eight o'clock I climbed the Wabash chimney and found probably three hundred swifts clinging to the sides of the brick wall four feet down and in a solid mass, three birds deep, on all four walls. At 9:30 A. M. on October 29, a number of birds left the chimney and circled, flying among the snowflakes for five minutes, but quickly returned to the chimney for protection. All day the temperature was about 32° and few birds left their retreat. As their food is 100 per cent insects, and no such life was flying, the swifts were without food. On this day I caught seventy-five of the birds. . . . On the 30th the day was cold, but the swifts were out for exercise. On the 31st it was much warmer and many birds were out. They flew close to the ground. . . . A few fell exhausted on the snow and some returned to the chimneys. . . . A dozen people telephoned me about

finding dead swifts. . . . At the Wabash chimney I opened the base of the flue and found about twenty dead birds. The cold weather continued and on November 16 the last swift circled over the town and departed for the south."

More wonderful yet is what Mr. Robert Ridgway wrote me under date of November 6, 1925. He says: "I have some interesting information for you concerning the Chimney Swift; information that has surprised me greatly and for which I am indebted to Mrs. Ridgway. Would you believe that they are still here in *large* numbers? Well, they are. The last one that I myself saw was seen October 18; but Mrs. Ridgway, who is in Lawrenceville (about twenty miles east of Olney) saw them every evening (this evening included) pouring down the chimneys of the High School building, by thousands. She says their numbers are undiminished; each morning they pour out of the chimneys and fly westward and that, when they return in the evening, they come from the west. What do you make of it? Where do they find enough insects for food? It is evident that we yet have very much to learn as to the habits of *Chaetura*." On a later date Mr. Ridgway wrote me that Mrs. Ridgway watched the swifts carefully and found them in summer numbers up to November 13, but next morning (November 14) there were very few flying about the chimney and then disappeared.

Mrs. Ridgway's last date, November 14, and Mr. Musselman's, November 16, were beaten by Miss Katherine H. Stuart, who observed a swift at Alexandria, Va., on November 19 (*Bird-Lore*, 1926, p. 59). In *Bird-Lore* (1926, pages 11-12) Dr. Oberholser gives a list of fifty-seven latest dates of swifts in the United States. Among these we find only four November dates, viz., November 2, 1919, Pensacola Fla.: November 4, 1896, New Orleans, La.; November 5, 1913, Charleston, S. C.;; and November 13, 1906, Richmond, Ind. There are nine dates between October 20 and 29, all considered exceptionally late dates. Dr. Robert Cushman Murphy was very much surprised to see a Chimney Swift flying above the snow-covered banks of the Miami River at Dayton, Ohio, on October 31, 1925. (WILSON BULLETIN, 1926, p. 157).

Thus we see that the mass, the millions of swifts, which spend the summer in the United States and Canada are gone after the middle of October, and all dates later than the twentieth of the month are exceptional occurrences, generally in small numbers. My latest dates of the last few years are 1917, October 21; 1918, October 10; 1919, October 19; 1920, October 26 (Jokerst October 29); 1921, October 17; 1924, October 19. To get these late dates I had to go to the big roost in the chimney of the greenhouse in Tower Grove Park, where they make no fire until it becomes really necessary, the superin-

tendent knowing of the swift roost. But one has not only to visit the chimney but also to watch its mouth closely, for in cool weather the few which come enter the chimney with little or no circling, come low and drop in immediately. Trusting to mere chance of seeing a swift on the wing one does not get those late dates. What kept them so extraordinarily late in 1925 and in such large masses as reported by Mrs. Ridgway is a mystery, though a great heat wave lasted in the Southern States till October 27, when it ended with a tornado in Alabama and zero and subzero weather in the Northwest.

It seems that the temperature alone does not decide the departure, as the record of 1924 shows. On September 2, 3000 swifts entered the Tower Grove chimney. On September 19, 4000; on September 26, 4800; on September 30, 3600; on October 2, 2000; on October 9, 2000; October 18, 60; and on October 19 only 10. The weather on the 18th and 19th was warm, 85° and 84° max., with all fall flowers in full bloom and the tropical water lilies, day and night bloomers, in Shaw's Garden and Tower Grove Park blooming so late in the year for the first time in fifty years. The change to cold came only on the 21st with frost on the 22d.

St. Louis, Mo.

HOW DOES THE TURKEY VULTURE FIND ITS FOOD?

BY JOHN B. LEWIS

A recent article in the *Auk* (July, 1928, pp. 352-355), by Mr. Alexander H. Leighton, entitled "The Turkey Vulture's Eyes," interested me greatly and called to mind some experiments I have made along similar lines, which may be of interest to others.

On January 19, 1927, a dead chicken was placed in an open field ninety yards from our home in a spot easily seen from the windows. A burlap bag was laid over the hen and a weatherbeaten box was placed over all to keep dogs from carrying the carcass away. Either the burlap or the box would have prevented the carcass from being seen, but would offer little resistence to the escape of odor. Either Mrs. Lewis or myself kept close, though not continuous, watch on the situation until February 21, without seeing a vulture near the box. At 10:30 A. M., on February 21, the temperature being just above freezing, the sky clear and a light west wind blowing, I removed the burlap and box from the carcass, placing the box four feet from it, so that if it had frightened the vultures away while the carcass was concealed, it would do so when the latter was exposed to view.

After arranging the carcass and box I carefully scanned the sky, and saw but one vulture, which was flying low in the southern horizon. L walked to the house, washed my hands and went to the window just in time to see a vulture (*Cathartes aura septentrionalis*) alight on the ground fifteen feet from the carcass. In less than as many minutes, three others alighted near the first. All four walked cautiously around the carcass and box for some time before venturing to begin the feast. The temperature all through this experiment was low enough that the carcass did not develop very much odor.

We might summarize the results of this experiment as follows: A dead hen lay in an open field concealed from sight for four weeks without attracting any apparent attention from the vultures that sailed across the sky every day. The carcass was then exposed to view without changing any other of the surroundings, and in less than ten minutes four vultures alighted within twenty feet of it.

On July 20, 1927, I placed the carcass of a Barred Terrapin, ten and a half inches long, under a box in an open field, for the double purpose of letting the carrion beetles clean the skeleton, and to learn whether the vultures would find it when concealed from sight. There was a crack, one-half inch wide by eleven inches long, in one side of the box five inches from the ground, but it is hardly thinkable that a vulture could have seen the terrapin through it, unless from the ground near the box. On July 24, at 1:00 P. M., seven vultures were on, and near, the box.

On December 21, 1927, I shot two stray tom cats that came to our place. The carcass of one was placed in an open field without concealment. The other was placed under a low, thick, branching holly tree in the same field, 140 yards from the first. The lower branches of the holly were far enough from the ground that a vulture could easily have got at the cat, but effectually concealed the latter from above. Thev ultures found the cat in the open the next day, and were at work at it, trying to get at the flesh under the tough skin, for several days. The cat beneath the holly attracted no apparent attention from the vultures during eleven days, at the end of which time it was carried off bodily during the night, probably by a dog.

At 8:20 A. M. July 15, 1928, the carcass of a newly killed opossum (*Didelphys virginiana*) was placed in an open field in view from the windows of my home and covered with a weatherbeaten box in which all cracks had been covered. Twenty-six yards from the box stood an old telephone pole, left from an abandoned line. This layout was watched closely, though not quite continuously, for four days. At

3:30 P. M., July 16, a vulture alighted near the box, walked up to it and remained eight minutes, then left. At 9:10 A. M., July 17, two vultures circled about over the box for four or five minutes and then left without alighting. At 10:00 A. M. on the same day a single vulture circled over the box and left. At 2:35 P. M. a single vulture circled over the box, then alighted on the telephone pole, where it remained twelve minutes. At 6:10 A. M. on July 18, I removed the box from over the opossum placing it four feet away. Decomposition was now far advanced, and many carrion beetles were at work. Omitting details, between 10:00 A. M. and 5:00 P. M., eighteen vultures came to the carcass, sailing low over it, many alighting on the telephone pole; but only one was seen to alight on it and eat. Two Black Vultures (*Coragyps urubu urubu*) were with the Turkey Vultures at this time.

I failed to go to the carcass of the opossum early in the morning of July 19 to see that it had not been devoured by dogs or other mammals during the night, but between 9:00 and 9:45 A. M. sixteen vultures, about half of which were of the black species, gathered about it and completely cleaned up whatever remained of it.

These experiments seem to indicate that in cold weather when little odor is thrown off, sight is the vultures chief means of locating food; but that they have no difficulty in locating it by scent alone, in warm weather when odor is strong.

These observations and some others of the author may throw light on a question raised by Mr. Russell M. Kempton in the WILSON BULLETIN for September, 1927, as to whether vultures willingly feed on the carcasses of carnivorous animals. That they will eat such carcasses there can be no doubt, as I have frequently seen them eating the carcasses of dogs and cats. They seem to have great difficulty in getting at the flesh of such animals on account of the toughness of the skin, for in some instances I have seen them work day after day without effecting an entrance into the body cavity. In such cases they eat the eyes, tongue, and usually manage to get some of the viscera through the vent.

In my own experience most of these cases have occurred in winter when food may have been scarce, and may not indicate that the flesh of carnivores is eaten from choice.

I hope to experiment further along this line very soon.

LAWRENCEVILLE, VA.

SOME ENVIRONMENTAL RELATIONS OF THE BIRDS IN THE MISSOURI RIVER REGION

BY JEAN M. LINSDALE

Over two hundred days were spent between 1921 and 1925 in an intensive survey of the land vertebrates of a small area of ground adjacent to the Missouri River in Doniphan County, Kansas. The center of the area is the townsite of Geary City at the point where a creek called Brush Creek enters the floodplain of the Missouri River. This paper is a summary of the more general environmental relations of the birds observed there. All statements made here are based on observations which were made within one and one-half miles of the center of the area.

The object of this work was to study the relations of the vertebrates to their environment and especially to gather data that would show as nearly as possible: what species of land vertebrates were present within the area; the frequency of occurrence and the relative abundance of those species; the local or habitat distribution of each of those species; the factors which determine the presence and habitat distribution of each species; the annual cycle of activity of each species in this area; a way to analyze vertebrate associations and successions.

The location for work was selected on the Missouri River because: little was known of the vertebrate fauna of that part of Kansas; a great variety in habitat conditions was present due to the influence of the river; rapid changes in the habitat and the vertebrate life could be studied.

Topography

About one-half the area included within this study consists of the Missouri River and its floodplain on the Kansas side. The remainder is made up of the bluffs which face the river and which are broken by the valley of Brush Creek, and a small part of the high land back of them. The riverside elevation at this point is close to 800 feet and the bluffs rise above this from 150 to 200 feet. They are of loess and limestone and are capped with loess. One part of the bluff contains some glacial drift material. There are several shelves on the bluff which mark former levels in the cutting of the river. These shelves are nearly level with steep slopes above and below them. The bluffs face the east and a little to the south. The creek flows in a deep valley that runs, in general, from the northwest to the southeast. In many places it has rather low banks on one side and high, nearly vertical cuts of loess on the opposite side. Back of the bluffs the topography is more rolling.

The Habitat

River. The Missouri River at this point may be said to have reached a stage of late maturity in the cycle of erosion. There is still a considerable amount of current but the valley has been eroded to a width sufficient to make room for meanders from bluff to bluff. During the winter the Missouri River at this point is important to birds chiefly as a feeding ground for a few of the aquatic species which migrate only as far south as they are forced by the frozen waters. During the spring the river furnishes a highway of travel for nearly all the species that migrate through the region. Some of those transients follow the water closely, some follow the shorelines and many of them follow the bluffs and the strip of bottomland bordering the river. In summer the river is used to some extent as a feeding ground for fish-eating birds, but its chief influence upon birds is indirect. This is its influence as an erosive agent in changing the extent and character of the land in the floodplain. During the fall the river again serves as a roadway for migrating birds. The birds appear to be dependent upon the river in much the same way as in spring except that they are not so hurried in their movements and they move down the river more slowly than they go north in the spring.

Creek. Brush Creek, a small stream which is usually dry during a part of the summer, flows across the area. The frequent, nearly vertical banks of loess material through which the creek has cut furnish suitable sites for nesting for several species of birds. The chief influence of the creek upon the bird-life of this vicinity lies in its work as an erosive agent. Since a large share of the land which the creek drains has been in cultivation a large amount of soil is carried away every summer during flood times. While most of this material is carried away by the river, some of it has contributed to the production of the Missouri River bottoms within the area of study. The deep creek valley also serves as a roadway for some birds both in their daily excursions to the uplands for food and in their migration flights.

Lake. Roundy Lake was formed by a shift in the course of the river which took place about twelve years before these studies were begun (1921). The course of the river was deflected by striking the bluff a short distance above this point so that it swung back to the east and left nearly 2500 acres of accretion to the Kansas bank. The lake was left in this newly made land. Brush Creek helped to fill in the lower end of the lake and later contributed largely to the decrease

Figure 1. Roundy Lake from the bluff on northwest side. Trees in foreground are on the bluff. Missouri River is shown in background. Photograph taken August, 1922.

Figure 2. Roundy Lake from east side. On opposite side of the lake at the left is shown a large patch of *Typha*. In the background is shown all the bluff included in this study and, in the center, the valley of Brush Creek as it enters the flood plain of the Missouri. Photograph taken June, 1922.

in depth and area of the water. In the summer of 1921 the water in the lake covered an area of nearly 200 acres. This area was constantly decreased until in the spring of 1925 less than forty acres of water surface remained. During the same period of time the depth was reduced from about four feet to less than two feet in the deepest place. In addition to deposits from overflow from the creek some material was left each season by the overflowing waters of the river, some was washed in from the adjacent bluffs, some dust was blown into the lake by the wind in dry times and when the ground was frozen in winter, and a great deal of organic matter was added by the invading vegetation which grew each summer and was added to the ooze of the bottom of the lake in the fall.

With an abundance of invertebrate and plant food, and being in a rather secluded location that was little disturbed by man, the lake furnished an excellent feeding ground for some summer resident birds, and an even better resting and feeding ground for several transient species.

LAKE-SHORE. In the fall of 1921 the water in the lake was high and the edge was back in the vegetation so that there was no portion of the shore that might in any way be suitable for shore birds. Doniphan Lake, three miles away, had a broad mud-flat around the water's edge upon which several thousands of shore birds were feeding at that season. The next fall (1922) the water was low in Roundy Lake and was high in Doniphan Lake so that the mud-flat conditions were the reverse of those in 1921 and the flats at Roundy Lake were covered with feeding birds from early in August until late in September, while none were seen at Doniphan Lake. The mud-flats attracted a large number of species that would otherwise not have been found in the area. All of them stopped to feed and a few rested on the mud, but no species was found nesting on the shore and none sought protection there.

The finding of meadowlarks on the exposed mud-flats on two different occasions indicated a slight relationship of this division of the habitat to conditions of an open prairie.

TYPHA. Cattail (*Typha latifolia*) was the most important aquatic plant for the birds of this vicinity. It grew in large patches of several acres. These patches were nearly pure stands in and around the lake.

SLOUGH. Several types of bodies of standing water on the flood-plain of the river may be classed under the name slough. All these are long, narrow and shallow depressions that are filled with water for a part or all of the year. On hot days in the summer many small

birds came to the springs and sloughs below them to drink and to bathe.

SALIX-POPULUS. The name Salix-Populus was given to that division of the habitat in which willows and cottonwoods were the most important plants. Several species of willow grew in mixed and pure stands in various parts of the ground where these plants were dominant. This type of vegetation covered all the bottomland of the Missouri River except that which was covered with water and that which was in cultivation. Accompanying the rich growth of vegetation on this bottomland there was an abundance of insect life especially in late summer and in the fall when birds were preparing for migration and were moving south.

CREEK-BOTTOM. The creek-bottom included a narrow strip of land which bordered the creek in its course through the area to the point where it flowed into the floodplain of the river. Here the soil was rich and deep. There was usually sufficient moisture to insure a great amount of vegetation during each growing season. In seasons, such as the summer of 1924, when there was an unusually large amount of flooding, the smaller plants and animals were covered with mud and they had little opportunity to grow. Black walnut, American elm, Kentucky coffee-tree, redbud, sycamore, and other trees found favorable conditions in the rich, deep soil along the creek and they grew to large sizes. The fact that there was no uniformity in the size of the various species of trees or in their spaciation indicated that the vegetation in this part of the habitat had reached a stage of climax.

BLUFF. The timber on the bluffs covered nearly all the ground, not in cultivation, within the area except that which was in the floodplains of the river and the creek. The vegetation on this part of the habitat was in a climax stage. The dominant trees were the various species of oak and hickory. In the spring and in the fall the timber on the bluff influences birds in much the same way as timber in other parts of the habitat except that there is a lesser attraction on the bluff than elsewhere for those birds which are usually found near the ground and which require a more dense ground cover than is present on most of the bluff. In winter there is less protection and less available food in the timber on the bluff except in the deeper ravines than in other types of timber and so this is the least used part of the woods at that season. Only small bands of birds which usually feed on the branches and trunks of trees were usually found on the bluff in winter. A few raptorial birds were found there throughout the year.

In summer the nesting facilities on the bluff are best suited to those birds which nest at some distance from the ground and in the branches of trees. A few nest on the ground and some nest in the cavities of the trees.

The bluff at this point has one peculiar relation to the daily activity of birds that was not noted in other parts of the habitat. That part of the bluff on which most of the work was done faces the east. In the morning the rising sun strikes the whole side of the bluff and it is quickly warmed so that insects become active and in turn the birds are active early after sunrise. In the afternoon shadows from the lowering sun fall over the bluff and it becomes cool sooner than the more level ground nearby so that activity of most birds as well as of other animals ceases earlier in the day on the bluff than on the more level portions of this area which receive sunlight until later in the day. In winter the activity ceases between three and four o'clock in the afternoon. In summer, activity stops on the bluff between five and six o'clock. It was also noted that activity ceases earlier in the afternoon on the lower part of the bluff than it does near the top where the warmth of the sun lasts for a longer time.

TIMBER-EDGE. Along the edge of the timber at the top of the bluff and around small timber patches there are narrow belts where conditions are partly like those of the timber and partly like those of open ground. Here are found small thickets of shrubs of various species and sometimes a dense growth of weeds and other herbaceous plants. Some kinds of birds, such as the flycatchers, were frequently found in the trees along the edge of the timber where there was an open ground on one side where they might make flights for insects. Several species seemed to prefer perches in the edge of the woods from which they sang or where they rested.

SPROUTS. Whenever a field that had been cleared of timber was allowed to lie fallow for one or more years or was used as a pasture, sprouts immediately began growing from the roots of the trees that had been removed. Among these sprouts there was usually a dense growth of some weeds such as sweet clover (*Melilotus alba*) which with the sprouts often formed a dense tangle that was seven or eight feet high. The sprouts grew rapidly if they were left alone, but usually they were removed after two or three years and the ground was again put into cultivation. In all about forty acres of the ground in this area was growing up in sprouts while this work was being done. These fields of sprouts had the greatest influence in summer when several species of birds selected them as nest sites.

Figure 3. Roundy Lake from the bluff on the west side. In the foreground is a large patch of *Nelumbo lutea*. In the center of the lake is a first year's growth of *Typha*. At the left and in the background is shown the Salix-Populus stand on one of the older portions of the bar. Photograph taken July 18, 1923.

Figure 4. Roundy Lake in winter. In the foreground is a snow-covered patch of *Polygonum*. Back of that is a strip of*Nelumbo* in which are shown some muskrat houses. In the background is shown the bluff as it appears in winter. Photograph taken February 6, 1924.

ORCHARD. The three small apple orchards within the limits of this area included less than an acre of ground and less than one hundred trees. Most of the trees were old and had not been properly pruned for several years and they were not sprayed in the summer. The ground under the trees and between them was usually planted to some truck crop such as potatoes.

ROADS. The public roads within this area totaled nearly six miles in their aggregate length. Most of these roads were narrow and were bordered by timber on one or both sides. Most of the roads were fenced off from the adjacent farm land. When the roads ran through or were bordered by timber the vegetation at their sides was practically the same as that of the timber-edge and the relation to birds was nearly the same in both. Parts of these roads were bordered by osage-orange which furnished favorable nesting sites and protection for several species of birds. Birds were frequently seen gathering food from the bare ground in the middle of the roads.

PASTURE. The amount of land in permanent pasture in this area was less than that which was in cultivation. Most of the land in pasture was on slopes that were too steep for convenient cultivation. Other than a few scattered trees the chief vegetation was blue grass (*Poa pratensis*). The thickness of the cover which this grass made was dependent chiefly upon the amount of grazing which was permitted on it. Few birds were found in these pastures in winter. A few species nested and fed in the pastures in summer.

CULTIVATED FIELD. This part of the habitat was entirely artificial. Probably less than one-tenth of the ground not on the floodplain that was included in this area was in cultivation. The fields were small and were usually hilly. A larger portion of the land in the river bottom was cultivated because it was level there and was free from rocks. The chief crop on the floodplain was corn. On the upland corn and wheat were raised and some land was planted to hay crops such as clover, alfalfa, and timothy. Nearly all the birds that were found in the cultivated fields came there to feed. In summer there was an abundant supply of insect food on the ground, on the crop plants and on the weeds. In the winter there was usually a good supply of weed seeds in the fields, or around the edges of them.

YARD. The part of the habitat which is considered under this head is that small bit of ground which surrounds each group of farm buildings within this area. Around each house there are numerous large shade trees that are not too crowded to have large and well

developed crowns. These trees are of the same species as those found on the bluff and along the creek. The ground beneath the trees is usually bare. In winter and during the seasons of migration the birds which feed in the trees in the yards are the same small groups which move along the creek bottom and along the bluff.

The nesting population of the yards is much greater in proportion to the number of trees than it is in the surrounding woods. This popularity of farm yards for nesting purposes may be partly due to the presence of more suitable situations in the trees that are found there, but probably it is largely due to the greater protection which this nearness to man affords. Although a few new enemies such as the house cat are encountered, many natural enemies are escaped when birds select their nest sites near human dwellings. Of course this applies only to those species whose nest sites are in the yards.

Buildings. Four groups of farm buildings were found within the limits of this area as well as several scattered sheds and deserted buildings that stood alone. These houses and buildings furnished nesting sites for several species. There were two bridges across the creek and several smaller bridges within the area. These furnished some nesting sites.

Environmental Relations

Dangers. Man is a direct menace to the lives of a great many individuals of a few species of birds within this area. Most of the smaller species are not directly harmed by man here. With the game birds the situation is very different. Most of the land game birds have been hunted so much that, in the area studied, their numbers have been greatly reduced or they have become extinct. This point on the river is almost equally distant from both Saint Joseph, Missouri, and Atchison, Kansas, and is a favorite hunting ground for parties from both cities as well as for the residents of the surrounding country. Hunting on the lakes is much better than that on the river and, during the hunting season, ducks were shot on the lake nearly every day. It is very likely that the number of game birds killed in any one year within this area and during this study did not exceed five hundred.

A very few larger land birds were killed by farmers who thought that the birds were doing damage or who could not resist the temptation to kill any strange and conspicuous bird which they might see. The smaller birds were usually not harmed and most of those that were killed lost their lives by accidentally being trampled in nests or by some other unavoidable accident.

A few house cats were kept at farm houses in the area. In summer these animals depended to some extent upon the surrounding bird population for food for themselves and their broods of kittens. Young birds in the nests and near the ground in the immediate vicinity of houses, and others that had just left the nest, were the ones most often killed by cats. The large number of young cottontail rabbits that was available during the summer season made it possible for this animal to be substituted for young birds by the cats and so the losses to bird life were reduced. No increase could be noticed in the number of nesting birds near the houses in years when no cats were present.

Snakes, especially the pilot snake and the blue racer, were found to be important as natural enemies of birds during the nesting season. These snakes were able to climb the trees to reach the nests and as they were common they probably destroyed many nests of young birds or eggs during each summer season.

Other animals that were natural enemies of birds were chiefly a few species of predatory mammals and some raptorial birds. In the fall mink tracks were seen leading to and away from the remains of ducks, but the birds may have been cripples that would have died from the shock of their wounds. As raccoons took a few chickens from coops near houses and as they were common, they may have destroyed birds in the woods. A few skunks of the genera *Mephitis* and *Spilogale* were present and may have killed some birds although no actual instances were noted. Coyotes and foxes were present in such small numbers that they could not have killed many birds. Squirrels were present in considerable numbers and may have destroyed a few nests.

Several species of raptorial birds were present in sufficient numbers to provide an important check upon birds both in summer and in winter. These birds were not only serious dangers during the nesting season, but as they were able to capture small birds on the wing they were feared at all seasons. Screech Owls were present during the whole year and in sufficient numbers to hunt over the whole territory. Short-eared Owls were found on the bar in winter and contents of pellets that they ejected showed that they had eaten Cardinals, Red-winged Blackbirds, and some small sparrows. Examination of these pellets indicated that less than one per cent of the food of this flock of owls during the time that it was present at this point consisted of birds. Other owls were found infrequently.

A few pairs of Cooper's Hawk nested in the timber and fed their young on chickens and probably other birds. Sharp-shinned Hawks were present in small numbers.

Figure 5. Dried mud at south side of Roundy Lake. Shore birds fed here before the mud dried as much as is shown in the photograph. Photograph taken September 24, 1922, by Dr. C. E. Johnson.

Figure 6. North part of Roundy Lake. Showing willow stumps in water in which Tree Swallows and Prothonotary Warblers nested. Photograph taken June, 1922.

No records of adult birds being killed by storms or bad weather were obtained during this study. High water from long continued and hard rains may have destroyed some nests that were placed too low. Strong winds destroyed some nests but most of them were rebuilt.

Examples were noted of a few dangers that are not included among those listed above. In late August when the woods were filled with spider webs of various sizes there was some danger of young birds becoming entangled in them. A Redstart was seen struggling to free itself from one of these webs on August 30, 1922. A gunshot nearby caused greater exertions and freedom for the bird. A crippled Virginia Rail which had probably hit a nearby telephone wire was found in a pasture on September 10, 1923.

Influence of Culture upon Birds

Favorable. The settlement and development of the land in this vicinity has benefited most birds in several ways. It has been accompanied by a decided increase in the variety and amount of food suitable for many species. The planting of cultivated crops has provided an abundant supply of grain which has been available for a short time between the time of ripening and the time of harvesting. Usually, there was left in the fields some waste grain which a few species of birds hunted out and ate. Insects have been introduced and have developed into a great variety of pests along with the planting and cultivation of crops. These are available for insect-eating birds. Many species of weeds have been introduced which have taken up every available bit of waste ground as well as the cultivated ground when special measures for their destruction have not been used. In addition to the insects for which these plants are hosts they furnish an abundant crop of seeds which is available through the winter for seed-eating birds. There has probably been an increase in the rodent population of this area proportionate to the amount of land that was put into cultivation. Greater numbers of these animals insured a much larger food supply for birds of prey.

Development of the land has made possible a greater variety of situations suitable for home sites for birds. This has made possible a greater variety in the species of birds which might nest in the vicinity and probably a greater number of individuals since a given bit of ground will support a larger population of birds usually if there are several species present than if only one or a few species live there. Clearing of land that was not immediately put into cultivation gave an opportunity for a new growth of sprouts and so gave new possibilities for nest sites. If the land were pastured blue grass

became the dominant plant and so another type of site was available for nesting. Orchard trees, shade trees, and planted trees along roads were spaced differently from those that grew naturally in the region and as a rule they had a different form from the native trees in their natural situations. Some species preferred these trees to the native trees for nest sites. Improvements such as bridges and buildings provide nest sites that are chosen by several species in preference to any that are found in the natural habitat. Making roads through the woods introduced more openings and tended to break down the climaxial character of the environment and by making it more complex made possible the presence of more species and individuals of birds.

The presence of man brought protection to some species of birds. Screech Owls often roosted in deserted buildings during the day. Juncos and other sparrows found excellent protection from the elements and from natural enemies by roosting in the tops of shocks of corn that were left in the fields. The same shocks were sometimes used in the daytime by resting Screech Owls. Human presence was also a benefit in that it caused the removal or decrease in numbers of some of the enemies of birds. Many raptorial birds were killed by hunters and farmers. Foxes, minks, bob-cats, and nearly all species of snakes were killed at every opportunity, so that their menace to bird life was greatly decreased. An increased interest in all birds, which most farmers in this vicinity have acquired, has led them to take special precautions in many instances for the protection and preservation of birds.

Unfavorable. Development of this region has in some ways been detrimental to the bird life of the vicinity. Mowing of hay lands while birds were nesting there has destroyed many nests with eggs or young. Cutting the timber, especially the larger trees of the bottomland, has removed some of the available nest sites of the larger species of birds so that they have gone to other localities to nest. Stock in pastures trample some nests.

The large amount of land that has been put into cultivation has affected the drainage so that most of the surface water runs off the ground rapidly after it falls, causing floods in the creek valleys and so destroying many nests that are placed near the ground. This change in the process or speed of drainage has tended to cause a restriction in the available supply of water for drinking especially during dry seasons when the creeks are nearly dry. This has had some effect upon the local distribution of some species in summer.

Destruction of some species of birds has been increased with human settlement in this area. Two important enemies (cat and dog) were brought in. They kill many birds. The destruction caused by these animals is greater than that of the same number of individuals of predatory animals that are native because the birds have developed no good means of escape from the imported ones. Men destroy many birds for sport and others because of an idea, sometimes mistaken, that they are harmful to agriculture in some way. An increased use of the roads by people in automobiles and the noise which the engines make as well as frequent picnic parties to the woods, the river and the lake frighten some of the more timid species away from the vicinity. Automobiles make hunting more destructive since this area is made more easily accessible by their use.

Influence of Birds upon Culture

Damage. A few pairs of nesting Cooper's Hawks fed their young chiefly upon small chickens which they took from farm yards in the neighborhood. English Sparrows damaged some of the vegetables that were grown in gardens by picking the young green leaves. The small amount of fruit that was grown on the farms within this area was damaged to a slight extent by birds. Catbirds were the chief fruit-eaters but they ate only a small part of the crop. Some small patches of grain that were sown near houses were damaged by English Sparrows which took nearly all the crop before it was harvested. Flocks of Bronzed Grackles in the fall damaged a few grain crops before they were harvested but they obtained only a small part of the grain.

Benefits. The game birds that were killed were used for food although they were hunted chiefly for sport and recreation. When this country was first settled the people were more dependent upon game for food than at present, but now the value of wild birds for food is very small in this vicinity.

Although most of the birds that were residents here fed upon insects or weed seeds, it was noted that in nearly every case the feeding range did not include the cultivated fields. Insect-eating birds fed chiefly upon insects that were found on the native vegetation. Birds that fed on weed seeds fed mostly on the waste ground where the growth of weeds was more dense and the available seed supply was greater than on the cultivated ground. Although these birds, each season, destroyed great quantities of weed seed, they apparently did not act as a check on the growth of weeds in the following season as every bit of available waste ground and all the fields, where

the weeds were not cut or plowed out, was filled with a dense growth of the weeds.

In the same way the birds of this area had little effect upon insect pests of the farm crops. Protective methods of cultivation were necessary to keep the fields and orchards free from insects as well as to keep them free from weeds.

The presence of the birds was neeessary, possibly, to help keep in check the native species of plants and insects which without some such check might also have become injurious. The birds cannot be depended upon to keep down those introduced pests which must be contended with in every effort to cultivate plants. The fact that the stomach of a bird shows that it has eaten some injurious weed seed or harmful insect cannot be evidence that that species of bird is actually beneficial unless it is shown that the bird really reduced the damage which the pest was doing to the crop. Careful notes made in this area in the period of this study show that the weed seed-eating birds and insect-eating birds were of little value in destroying the actual pests of the crops that were cultivated. No attempt was made to determine to what extent these birds prevented native plants and insects from becoming serious pests to the crops. The situation is different in the timber. Very little of the timber is suitable for lumber and that which is used is chiefly used for firewood and fence-posts. Insect-eating birds which fed in the woods obtained their food directly from the trees and they probably were important as checks to prevent the increase of insect enemies of the trees.

Most of the Raptores were important as enemies of rodents although it is doubtful whether they had a great deal to do with the number of these rodents that were present. The increase and decrease in the numbers of the various species of rodents appeared to go on independently of their destruction by birds of prey. It was noted that when rabbits and field mice were most abundant, the number of hawks and owls present within the area was larger than when the number of rabbits and rodents was small. Since whole colonies of the rodents would suddenly disappear, it seems probable that their destruction was due to some other cause than that of being eaten by birds; in which case they would surely have decreased in numbers more gradually. It appears, then, that the number of rodents present has more influence in regulating the presence of predatory birds in this area than the number of the birds has in regulating the number of the mammals.

Response to Seasonal Change

Spring. With the beginning of spring weather, which is usually accompanied by the breaking of the ice on the river and the thawing of the ice on the creek and the lake, the early migrating ducks appear. Late in January Mallards and Pintails come. There is little change among the smaller land birds. Small groups of several species wander over several sections of territory on warm days. During cold waves they seek sheltered places and move very little. In February more of the water birds arrive. Herring Gulls, geese and Lesser Scaup Ducks were seen on the river. There are more warm days in this month and consequently there is more activity among the smaller species of birds. In March more species and larger flocks of ducks are found. The Pectoral Sandpiper, Greater Yellow-legs, and Killdeer are the wading birds that arrive in this month. Some of the winter visitant raptorial birds leave in March and other birds come from farther south. Belted Kingfishers become common. The first Phoebes that arrive in March are sometimes unable to find flying insects. Flocks of blackbirds begin to arrive during this month. Field Sparrows and Swamp Sparrows become common and the Ruby-crowned Kinglet arrives. There is some mating activity among the ducks on the lake and the Red-tailed Hawk and the Prairie Horned Lark begin to nest in this month.

During April and the first half of May, most of the summer residents arrive and begin nesting and the transients pass through on their way to the north.

Summer. During the first week in June a few straggling transients, chiefly crippled and aquatic birds, are still present around the lake. Most of the bird activity consists of caring for the young which, in the case of most summer residents, have hatched by this time in those nests which have met with no serious accident. Later in the month another nest is built by those species which nest a second time. Seventy-four species were found in July, nearly all of which nested within this area. Some species which nested there and were not common, were not found in July and a few that were found in July may not have nested within the limits of this area, but all of them probably nested within a few miles of there. On some of the hot days in July most of the birds were quiet and they were found in the shaded ravines where there were small pools of water. Larger birds, such as the Crow, were seen flying over on hot days with their mouths open on account of the heat. After the period of nesting most of the birds are hard to find for a few weeks while they are molting.

In some species the young and old birds gather in small flocks which range over a limited territory in search of food.

FALL. In early fall the bird population of this area is increased by a few species that reach this point by the first of August. The first to arrive are some of the Limicolae. Some species, as the Little Blue Heron, were found during their post-nest season wanderings. In the last part of this month several species of warblers arrive and are found for a few days feeding in the dense growth of vegetation. The largest number of species and individuals, for any fall period, is present in the first two weeks of September. Ducks are found on the lake from the last of August until the middle of November. Most of the insect-eating birds leave by the middle of October and for the next two weeks the smaller transients are chiefly the seed-eating Fringillidae.

WINTER. The winter visitants to this area arrive in November and December and for a period in late December and early January there is a minimum of bird activity, when most of the birds present are flocks of seed-eaters which feed in the weed patches and the Raptores which feed on the small mammals. Thirty-four species of birds were found in December, the month with least activity.

RELATIONSHIPS BETWEEN SPECIES

The relations, that were noted between the species of birds that were recorded in this study, were largely food relations. Some of the birds of prey depended to a large extent upon their success in catching the smaller birds for a sufficient food supply. The sparrows and other small species that fed in thickets near the ground almost always flew hurriedly to thicker cover and became quiet whenever one of the smaller hawks appeared. Feeding shore-birds in flocks became nervous, called, and flew short distances when hawks flew near them. Pellets that were gathered from the roosting ground of a flock of short-eared owls contained remains of three species of small birds, but the number of individuals of birds eaten was very small in proportion to the whole amount of food, which was composed largely of rodents and shrews.

When any raptorial bird was discovered by Crows, the Crows began calling and flying around it and within a few minutes several hundred individuals, in some seasons, would be calling near the bird. If the bird moved the Crows would follow and continue their noise. If the bird remained quiet the Crows would soon tire of their excitement and would gradually scatter. These gatherings of Crows were

more often seen in winter than in summer as more and larger flocks of Crows were present in winter and there were more raptorial birds in winter.

Some discord was frequently noted between different species that nested near each other. Blue Jays chased Robins out of the former's nest tree. Wood Pewees drove intruding Blue Jays from the vicinity of their nests. Blue-gray Gnatcatchers and Ruby-throated Hummingbirds frequently were seen flying at some larger bird that was perched in or near the nest tree of the smaller one. In contrast to this, several instances were noted in two different species nested in the same tree. Blue Jays and Summer Tanagers nested at the same time in the same tree. Orchard Orioles and Yellow Warblers together nested in the same willow tree.

Usually when two or more species nested in the same kind of tree or in the same part of the habitat they chose different types of situations for their nests so that in most cases the kind of surroundings for the nest site was peculiar to each species. In some cases two closely related species chose nest sites that were similar in some ways but there were always some features that made each specifically distinct. For example, the Red-winged Blackbird and the Yellow-headed Blackbird nested in cattail and at about the same height but, within this area, the Yellow-headed Blackbird was limited to those patches of cattail which grew in water while the Red-winged Blackbird, in addition to that type of location, sometimes chose more dry situations and even nested in trees. This variation in the choice of a homesite made possible a much larger bird population since the supply of suitable nest sites would accommodate many more pairs than it would if they were more nearly alike in their choice.

On the feeding ground there was less necessity for insuring a permanent food supply as the adult bird could move to new grounds when the supply was exhausted at the old one. It is impossible for most species to move their nestlings so that some device is necessary to provide for the proper spaciation of the nesting pairs of birds. The capacity of each species to select a nest site of a type peculiar to it provides this device.

After the close of the nesting season, during the season of migration and in the winter groups of several species of birds were often found together and feeding. Sometimes, as in the case of those water birds which feed in flocks, most of the shore birds, the swallows which flew over the water and most of the smaller birds which fed in weed patches, the various species showed very little preference peculiar to

each one in selecting feeding grounds. For other species which gather food singly, as most of the Raptores, or which feed in groups which move through the timber where there are many types of feeding habitat, there is usually some choice in the particular part of the feeding ground which the individuals of each species occupy. The kinglets, creepers, titmice, woodpeckers, sparrows, warblers and wrens in a group of feeding birds each selected a part of the feeding ground peculiar to it and over which it fed without conflicting with birds of other species.

For roosting and for cover it is still less necessary that each species occupy a "niche" than for the other types of major activity. It was found that a particularly desirable thicket was used by many small species of birds as a refuge from enemies and as a roosting place.

It seems likely that in making any sort of study of the associations of birds it is necessary first to take into account the major activities of the species that are concerned. The knowledge of the mere presence of birds of two or more species in the same or a similar habitat is surely not significant in this connection unless the activity of each of those species in that habitat is known.

Succession

In every part of the habitat there was a constant change in the environmental conditions. These changes proceeded at different rates in the various divisions. Within this area the vegetation serves not only as an index to other environmental conditions, but for most of the nesting birds it appeared to be the most important factor in their presence or absence and in their local distribution.

Within the habitat area studied there are two kinds of habitat changes that are of major importance to the bird life of the vicinity. Each has a different cause and each has a different effect upon the birds. First, there are the natural changes, the most important of which are those which depend upon the erosive action of the Missouri River. When a change in the course of the river leaves a saucer lake such as Roundy Lake, a group of the birds which migrate up and down the river, but which do not regularly feed there, stops to feed in the more favorable lake waters. As soon as the aquatic vegetation has had a chance to develop in the lake to an amount sufficient to provide hiding places and nest sites, another group of birds is attracted which although present in smaller numbers, usually, than the first group, is present for a larger portion of the year. If the water of the lake is drained or is dried up too rapidly for a growth of vege-

tation and it leaves a broad belt of mud, still another group of birds is attracted to the ground to feed.

Sometimes the lake stage is omitted and in its place silt and sand are deposited to a level above the usual height of the water. When this happens or when the lake is gradually filled in so that the ground becomes dry, a dense cover of young and rapidly growing trees and other plants soon covers the ground. In their first seasons of growth these plants provide nesting sites for a few species of birds. If these plants are allowed to continue their growth the character of the vegetation is changed within three or four years so that the birds which nested there at first can no longer find suitable locations for their homes and so they are forced to live in another locality.

From this stage several factors control the development of the vegetation on the river floodplain in such a way that the growth goes on at different rates. Therefore a greater variety in available nest sites is produced so that a greater number of species and individuals remains to nest. If this land is allowed to remain in its place the development of the covering of plants continues. As the development proceeds the rate of change becomes slower until it is nearly imperceptible from one season to another. With some of the changes in the character of the vegetation some new species of birds are added to the list of possible residents and at the same time a few species that have nested there are eliminated because they can no longer find suitable home sites. For example, Crows and Warbling Vireos do not usually nest in the bottomlands until the cottonwoods have reached a certain size which requires about fifteen years of rapid growth. The Traill's Flycatcher does not nest after the willows have passed the thicket stage. Some other species, as the Yellow Warbler, nest in trees that are a little larger. In this way the nesting birds are added to or eliminated from the bird population. There is a gradual change in the group of nesting birds which corresponds to the change that takes place in the vegetation and which is caused chiefly by that change in the vegetation.

Natural changes or those changes which are set working by natural causes take place very slowly in other parts of this area so that only a very slight change is noticeable from year to year. The vegetation has reached a stage of climax on the bluff and in most of the creek bottom and so there is very little change in the bird life there that is due to naturally induced changes in the vegetation. A tree may die and furnish opportunity for hole nesting birds to make homes. Other trees are blown over and a small opening is made in

the timber. A new development of the cycle of plant growth on the bluff begins in these small places. In these clearings there is an opportunity for new species of birds to find home sites for a few years.

Predatory animals and other factors cause some changes in the bird life that can be noted when the effect of the changing vegetation has ceased to be the most important cause of succession in birds. These other factors are also at work in the other parts of the area but their effects are overshadowed by the greater effects of the plant changes.

The second great cause of avian succession in this area is the work of man. This work and its relation to birds has been discussed under the head of Relations to Culture. The works of man tend to cause an even greater irregularity in the succession than that which takes place under natural conditions and a more varied and therefore larger bird population can be supported on the ground than was possible under primitive conditions. With a greater utility of waste land and other resources, a point may finally be reached when the effect of man's work in this vicinity will be to eliminate nearly all the bird species.

At this time (1925) the area under discussion probably has a larger bird population than it had when it was entirely in primitive conditions. A few large and conspicuous species are extinct but many more are found now that were probably not present when the country was settled.

Help from all persons who aided in this work is appreciated. Among those who helped are Dr. C. E. Johnson, who suggested that the work be undertaken and who was generous in giving help and suggestions; Mr. C. D. Bunker, who loaned museum materials for collecting specimens during the first part of the work; and Dr. H. H. Lane, who directed the work during the last two years and who helped with the writing of the report. I am also indebted to the Department of Zoology of the University of Kansas for the use of Biological Survey funds and for the loan of materials to be used in field work.

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Museum of Vertebrate Zoology, University of California,
Berkeley, California.

BIRDS OBSERVED IN THE VICINITY OF SANTIAGO DE CUBA

BY STUART T. DANFORTH

During the summer of 1926 the author spent nine days, from June 29 to July 7, studying birds in the vicinity of Santiago de Cuba. This is the second largest city in Cuba, and is situated in the southeastern part of the island. Very little has been written recently about the birds of this particular part of the Republic, though many visitors from the North spend a short time there, either to visit or in transit to other places. This list may be of interest to ornithologically inclined visitors, as from it they may obtain some idea of what resident birds it is possible to see during a short stay. A few rather unusual records were also obtained during the short time spent in this region. An annotated list of the fifty-four species observed follows.

LEAST GREBE. *Colymbus dominicus dominicus* Linne. About twenty pairs were breeding at the Laguna del Sitio, a fresh water lake some four miles east of the city. On July 5 eight nests with eggs and a number of adults accompanied by young birds were observed. The nests were floating and anchored to nothing but floating pondweeds (*Naias*), where the water was about eighteen inches deep, and were constructed of the same weeds. Those which were examined closely contained four eggs apiece. On leaving the nests the incubating birds would cover the eggs with pondweeds, but if I waited quietly they would return in half an hour, remove the weeds, and resume incubation. This occurred at noonday, in the broiling sunshine, thus tending to disprove the theory sometimes advanced that grebes let the sun incubate their eggs whenever possible.

WEST INDIAN PIED-BILLED GREBE. *Podilymbus podiceps antillarum* Bangs. About 125 were noted at the Laguna del Sitio on July 3 and 5. Many young birds of various sizes ranging from a quarter to three-quarters grown were seen, and about ten nests with eggs. The nests were floating affairs made of *Naias* and anchored to bits of brush. Some of them were too far out in the lagoon to be examined closely, but on those the incubating adults could be observed. Four nests were examined closely. Three of these had six eggs apiece, old and stained, while the fourth had one fresh white egg. One adult was noted in a grassy slough nearer the city.

ROYAL TERN. *Sterna maxima* Boddaert. Six were seen in Santiago harbor on June 29.

CABOT'S TERN. *Sterna sandvicensis acuflavida* Cabot. Five were seen over the mudflats at the head of the bay on July 3.

LEAST TERN. *Sternula antillarum* Lesson. Not seen at Santiago, but one was observed from the boat at Punta Negra on June 29.

RED-FOOTED BOOBY. *Sula sula sula* Linne. Not seen at Santiago, but one was seen from the boat, diving repeatedly half a mile from the shore at Punta Negra on June 29.

BROWN PELICAN. *Pelecanus occidentalis* Linne. Common in Santiago Harbor.

YELLOW-BILLED TROPIC BIRD. *Phaethon lepturus catesbyi* Brandt. One was seen at Punta Negra on June 29.

RUDDY DUCK. *Erismatura jamaicensis* subsp. Four full plumaged males were noted at the Laguna del Sitio. Unfortunately it was not possible to collect them to determine their subspecific identity.

SNOWY EGRET. *Egretta thula thula* Molina. One was observed July 5 at the Laguna del Sitio.

SOUTHERN LITTLE BLUE HERON. *Florida caerula caerulescens* Latham. Not common. A few were seen in the mangroves and at the Laguna del Sitio.

WEST INDIAN GREEN HERON. *Butorides virescens maculatus* Boddaert. Was seen in the mangroves; at the Laguna del Sitio, and along the Rio Rafael Diaz near Hongolosongo.

CUBAN CLAPPER RAIL. *Rallus longirostris cubanus* Chapman. Common in the mangroves near the bay.

CUBAN KING RAIL. *Rallus elegans ramsdeni* Riley. One of these rare birds was seen running along the edge of the Laguna del Sitio on July 5.

FLORIDA GALLINULE. *Gallinula chloropus* subsp. About 800 were counted at the Laguna del Sitio, including many young of all sizes from newly hatched birds still in the nest to nearly full grown birds. Ten broods of tiny downy young were observed, and several nests with from one to six eggs. Most of the nests were made of sticks and lined with leaves or pondweeds (*Naias*), though some were constructed entirely of Naias. One nest contained four newly hatched young and two eggs on July 5. The young dived into the water when I approached the nest closely, and swam well, but were easily captured to be photographed. The subspecific identity of the Cuban bird is uncertain.

CARIBBEAN COOT. *Fulica caribaea* subsp. About forty adults and many young, including two pairs followed by broods of downy young were observed at the Laguna del Sitio. A nest containing one egg was also discovered. It was made of sticks and was lined with coarse grass. It was a floating affair anchored to a small dead thorny tree

in water eighteen inches deep. I greatly regretted being unable to collect any specimens, as the status of the Coot breeding in Cuba is in doubt.

BLACK-NECKED STILT. *Himantopus mexicanus* Miller. Four pairs were apparently nesting in a salt swamp at the head of Santiago Bay, and a noisy flock of forty, apparently not nesting, frequented the shallow end of the Laguna del Sitio.

ANTILLEAN KILLDEER. *Oxyechus vociferus rubidus* Riley. One was observed on June 30.

WEST INDIAN JACANA. *Jacana spinosa violacea* Cory. About twenty of these pugnacious birds formed a conspicuous feature of the bird life of the Laguna del Sitio.

CUBAN QUAIL. *Colinus cubanensis* Gould. Fairly common in suitable localities.

CUBAN MOURNING DOVE. *Zenaidura macroura macroura* Linne. Abundant. A nest was found near the Laguna del Sitio.

ZENAIDA DOVE. *Zenaida zenaida zenaida* Bonaparte. Not uncommon.

WHITE-WINGED DOVE. *Melopelia asiatica asiatica* Linne. Not uncommon. A few were seen on almost every day's trip.

CUBAN GROUND DOVE. *Chaemepelia passerina insularis* Ridgway. Common. A nest with two eggs was found about three feet from the ground in a small mangrove at the head of the bay on July 3.

SOUTHERN TURKEY VULTURE. *Cathartes aura aura* Linne. Abundant and exceedingly tame.

BLACK VULTURE. *Coragyps urubu urubu* Vieillot. Four vultures were seen flying around near the summit of a high hill above El Cobre which I feel confident were of this species, despite the fact that there is only one previous Cuban record for the species. They were observed closely, and I was already familiar with the species in other places. Their black heads, all black plumage with the exception of white under the wings, and small size were all noted distinctly.

CUBAN SPARROW HAWK. *Falco sparveroides* Vigors. Several were seen, about half in the red phase and half in the light phase.

SIJU OWL. *Glaucidium siju* d'Orbigny. These little owls, which are active by day, were noted at Serafina and Hongolosongo. At the latter place one was calling to and answering another a short distance away. The call was a loud rather high pitched *tsweep*, a most unowl-like sound which had me baffled for awhile until I saw the bird.

ANI. *Crotaphaga ani* Linne. Common.

CUBAN LIZARD CUCKOO. *Saurathera merlini* d'Orbigny. Frequently observed in brushy places.

MAYNARD'S MANGROVE CUCKOO. *Coccyzus minor maynardi* Ridgway. A flock of five were seen east of the city on July 5.

YELLOW-BILLED CUCKOO. *Coccyzus americanus americanus* Linne. A few were seen.

EASTERN CUBA TODY. *Todus multicolor exilis* Barbour and Brooks. Fairly common in the hills west of El Cobre, and one was seen close to Santiago.

CUBAN WOODPECKER. *Centurus superciliaris superciliaris* Temminck. A few were seen at El Cobre and Hongolosongo.

CUBAN TROGON. *Priotelus temnurus temnurus* Temminck. Common in the wooded hills near Hongolosongo and Serafina.

RICORD'S HUMMINGBIRD. *Ricordia ricordii ricordii* Gervais. A few were seen near Santiago.

CUBAN NIGHTHAWK. *Chordeiles minor gundlachii* Lawrence. Common near Santiago.

GRAY KINGBIRD. *Tyrannus curvirostris curvirostris* Hermann. Common at the Laguna del Sitio and at Hongolosongo, but apparently rather scarce in the immediate vicinity of Santiago.

CUBAN PETCHARY. *Tolmarchus caudifasciatus* d'Orbigny. Common at Hongolosongo, but not seen nearer the city.

BOBITO. *Myiarchus sagrae sagrae* Gundlach. Seen only in the hills near El Cobre and Hongolosongo.

CUBAN PEWEE. *Blacicus caribaeus* d'Orbigny. A few seen near Santiago and El Cobre.

CUBAN REDWING. *Agelaius humeralis* Vigors. Quite common.

CUBAN ORIOLE. *Icterus hypomelas* Bonaparte. A few were seen, mostly adults accompanied by their young.

CUBAN GRACKLE. *Ptiloxena atroviolacea* d'Orbigny. Quite common, and found in flocks, sometimes in company with the Wedge-tails.

EASTERN CUBA WEDGE-TAIL. *Holoquiscalus jamaicensis gundlachii* Cassin. Not seen as frequently as the Grackles, and seen only in company with them.

ORANGE-FACED GRASSQUIT. *Tiaris olivacea olivacea* Linne. Common.

MELODIOUS GRASSQUIT. *Tiaris canora* Gmelin. A few were seen in the hills near El Cobre and Hongolosongo.

CUBAN MARTIN. *Progne cryptoleuca* Baird. Many were nesting in the city of Santiago. One followed the steamer for about half an hour near Punta Negra, in extreme eastern Cuba.

Cuban Cliff Swallow. *Petrochelidon fulva cavicola* Barbour and Brooks. Was found nesting in the caves under the Morro Castle at the entrance to Santiago Harbor. Considerable numbers were also seen at the Laguna del Sitio.

Black-whiskered Vireo. *Vireosylva calidris barbatula* Cabanis. Common.

Blue Honey Creeper. *Cyanerpes cyaneus* Linne. One was seen at Hongolosongo on July 4.

Cuban Golden Warbler. *Dendroica petechia gundlachii* Baird. Common in the mangroves at the head of Santiago Bay.

West Indian Mockingbird. *Mimus polyglottos orpheus* Linne. Abundant.

Eastern Cuba Thrush. *Mimocichla schistacea* Baird. These noisy birds were common in wooded hilly regions near El Cobre, Serafina and Hongolosongo.

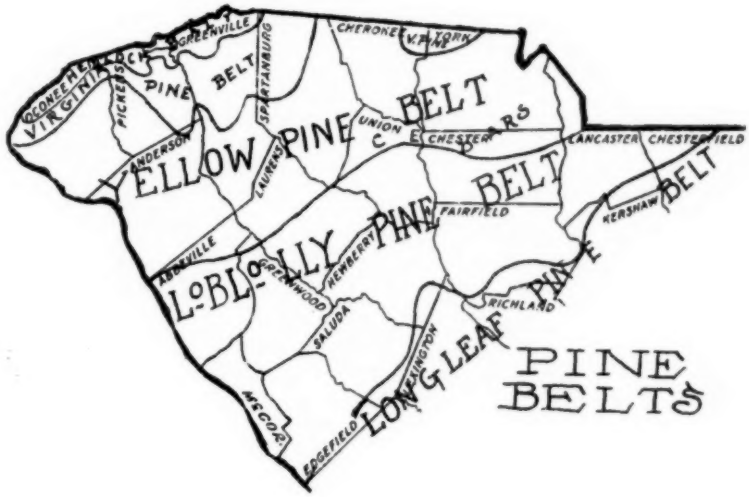
College of Agriculture, University of Porto Rico,
Mayaguez, Porto Rico.

BIRDS OF UPPER SOUTH CAROLINA: A STUDY IN GEOGRAPHICAL DISTRIBUTION

BY A. L. PICKENS

The great Carolinian or Upper Austral (biological) Zone, which includes nearly all of the middle states, is joined to the Atlantic slope portion of the same zone, by a very narrow strip, that passes through the upper part of Georgia and South Carolina. Upper South Carolina, is that part of the state, between the Fall Line and the top of the first ridges of the Appalachians. The Fall Line is a geological boundary, marking the points at which the streams plunge over falls or shoals, in their descent from the hard rocks of the hill country to the softer sediments of the Tertiary formations of the Coast Plain. It runs through the central part of the state from Augusta, past Columbia, to the Yadkin or Peedee River near the North Carolina line. Above this natural boundary occur five distinct topographical belts, each with a preference, beyond that of neighboring zones, for some particular species of pine. First we have the Sand Hills featured by long-leaf pines; next comes the Lower Piedmont, with rocks of a slatey nature, and hills covered with loblolly pines. A secondary fall line occurs at river-bed elevations of about four hundred feet, where the streams drop from the granitic region into the slate regions, and then we find the Upper Piedmont with yellow pines. Still higher, at general eleva-

FOOT HILLS
UPPER PIEDMONT
LOWER PIEDMONT
SAND HILLS
GREENVILLE
SPARTANBURG
CHEROKEE
YORK
OCONEE
PICKENS
ANDERSON
LAURENS
UNION
CHESTER
LANCASTER
CHESTERFIELD
Lockhart Shoals
Enoree Shoals
FAIRFIELD
KERSHAW
ABBEVILLE
Ware Shoals
GREENWOOD
NEWBERRY
SALUDA
RICHLAND
LEXINGTON
EDGEFIELD
MCCORMICK
AIKEN
Calhoun Falls
MID-PIEDMONT FALL LINE
TRUE FALL LINE
TOPOGRAPHICAL AREAS


PINE BELT
YELLOW PINE BELT
LOBLOLLY PINE BELT
LONGLEAF PINE BELT
GREENVILLE
SPARTANBURG
CHEROKEE
YORK
OCONEE
PICKENS
ANDERSON
LAURENS
UNION
CHESTER
LANCASTER
CHESTERFIELD
FAIRFIELD
KERSHAW
ABBEVILLE
GREENWOOD
NEWBERRY
SALUDA
RICHLAND
LEXINGTON
EDGEFIELD
MCCORMICK
AIKEN
PINE BELTS

tions of 900 to 1000 feet, comes the Foot-hill Belt, with Virginia or Jersey pines more common than elsewhere, and then the hardwood covered mountains with Hemlocks scattered through their ravines.

These topographical belts, and the pine belts too, are traceable into the adjoining states. In warmer Georgia, however, the long-leaf and the loblolly pines are inclined to climb to higher altitudes, above the shelves occupied in South Carolina, and in cooler North Carolina to drop below them.

In round numbers, four hundred vertebrate forms have been catalogued from Upper South Carolina, including 49 fishes, 41 amphibians, 44 reptiles, and 36 mammals. Birds exceed all other vertebrates in approximate proportion of 9 to 7, and all other air-breathing vertebrates by more than 2 to 1. They are of course the most important group, in determining the boundaries of biological zones. The forms recorded for this part of the state are here given.

For some time a few workers in the upper parts of Georgia and South Carolina have been impressed with the number of species, typically of the Lower Austral Zone, that occur within the very shadows of the mountains, though the fourth Provisional Zone Map of the U. S. Biological Survey, shows nearly all of Georgia and South Carolina, above the Fall Line, as being in the Upper Austral Zone. Working with an older list of diagnostic species I decided that the Yellow Pine Belt was barely Carolinian, or Upper Austral, so placing the upper limit of the Lower Austral along the upper limit of the loblolly pine's range. Not thoroughly satisfied, and possibly feeling I was getting too far north, I wrote to Mr. A. H. Howard of the U. S. Biological Survey, and secured a more recent list of forms by which zones are traced. Among birds there were nine characteristic of the Lower Austral, and five of the Upper Austral. All the nine breed in the Sand Hills, and all of the five in the mountains! To show the relation by belts I constructed the following table:

	Sand Hills	Lower Piedmont	Upper Piedmont	Foot-hill Belt	Alpine Belt
Upper Austral forms.....				3	5
Lower Austral forms.....	9	8	1	2	

Another name for the Upper Austral is Carolinian, and I was surprised to find these researches had almost driven the Carolinian claim from South Carolina, only four of her forty-four counties showing the Carolinian, and these only in their higher reaches! Mammalian, reptilian, amphibian, and botanical forms are found that tend to support these conclusions. Lung-breathers carry the battle line of the Lower Austral upward into the highlands, but gill-breathers

coming down the streams make the waters more northerly in character. Following the map that represents this as an Upper Austral area, I have elsewhere, in cataloging the fishes, remarked that they made up a group more related to northern than southern regions, and more consistent with the Carolinian Zone. I have been reminded, however, that fish, influenced by the coolness of mountain streams, are frequently found in the next zone below their proper one. This would of course hold with water-dwelling salamanders, of which we have found several forms well-down into the Piedmont.

To set hard and fast boundaries between the biological zones is, of course, impossible. They apparently shift from time to time, a hot, dry summer favoring the Lower Austral forms, a cool, wet one the Upper forms. The zone notations given above are chiefly from Chapman's Handbook. Counting all available records, the number of species from the Upper Austral Zone are in the lead, even in the Upper Piedmont, but some of these are for single nesting records, and some now appear to have been driven to the mountains by deforestation, whereas most of the recorded Lower Austral forms are constant, and often abundant as to individuals. From the quandary escape is offered in Mr. Howard's diagnostic list, for four Lower Austral and no Upper Austral forms are now found in the higher Piedmont. In the Foot-hills three of the latter appear. It would seem that the Upper Austral, or Carolinian Zone has for its southern boundary in South Carolina, an indefinite limit, roughly following the Foot-hills from Oconee County to higher Spartanburg. In the upper Savannah Valley, it is squeezed against the Transition or Alleghanian Zone in the vicinity of Rabun Mountain. At one place it is apparently a mere wasp-waist of fifteen or twenty miles. This narrow tie is all that holds the Carolinian territory of Iowa, Kansas, southern Ontario and Tennessee to that of New Jersey and Long Island. Slightly to the east of this point, in Pickens and Transylvania Counties, one may, inside of two counties and in a width of forty miles, travel in all the great biological zones between the Gulf of Mexico and the Gulf of Saint Lawrence!

All published records, heretofore, have been vague on the matter of the zone boundaries in this state. Cope, in 1875 and again in 1898, in his "Geographical Distribution," says of the Upper Austral or Carolinian Zone, "It embraces a wide belt in Maryland and Virginia, and all of central North Carolina, and then narrows very much in passing round south of the Allegheny Mountains of Georgia." Loomis, in 1890, in his *Auk* series on the Summer Birds of Pickens County re-

marks, "Three avifaunae meet in the South Carolina highlands—the Louisianian, Carolinian and Alleghanian. The first named is not prominent, the local ornis being characterized by species representative of the Carolinian and Alleghanian, those of the former preponderating. In his Birds of Chester County series published in the Nuttal Bulletin and in the *Auk*, he says in 1891 of Chester County, "The general character of the fauna is Louisianian. The near proximity of the mountains exerts a modifying influence upon it, lessening the force of the Louisianian, however, rather than bringing into marked prominence the Carolinian.'

To what extent these pine belts could be used in determining subzones of bird and other life I cannot say, but I have found them of value in South Carolina and Georgia. Certainly the long-leaf pine gives good evidence of the Lower Austral, and the loblolly a slightly toned-down belt of the same, so long as we keep to these latitudes. Further north along the coast, however, they are found to Cape May, beyond their wonted zone. It is possible, though, that southern New Jersey would be Lower Austral but for the wide breaks of the Chesapeake and Delaware. Yellow pines are found from mountains to sand hills, but are more dominant in the Upper Piedmont. The Virginia pines are also found below their belt, but being lovers of thin sterile steeps, they become more conspicuous in the worn fields of the foot hills. From there on the hardwood forests become more pronounced, and Carolinian forms seem to prefer such. The Hemlocks of the Alpine area are safely indicative of Upper Austral.

The foot-hills of the famous Kings Mountain Range, while very low, add an alpine touch in Cherokee and York, with a wide spray of more Jersey pines. Perhaps such an outlying area is to be regarded more in the nature of the patches of such trees found on steep river banks, even in the Loblolly Belt, rather than as part of the Jersey Pine Belt, recognized by lumbermen and dendrologists. This same range disrupts the topography, elevating part of the slate area, normally Lower Piedmont in character, to higher levels. The wide valleys of the Broad and Savannah Rivers, also offers avenues for the mingling of forms from the different belts. This difference between belts is noticeable, not only among summer breeders, but among winter visitors and residents.

I am grateful to Mr. A. H. Howard for aid in tracing the approximate zone boundary, and for various forms of aid from Messrs. Gabriel Cannon, P. M. Jenness, Franklin Sherman, Thomas Smyth, Wm. Hahn, Jr., E. R. Blake, G. E. Hudson, Arthur Wayne, Joseph

Ledbetter, and Miss Mary Baughan of South Carolina; Messrs. T. D. Burleigh, E. R. Greene, and G. A. Dorsey of Georgia; Mr. W. L. McAtee of Virginia; Mr. C. J. Pennock of Pennslyvania; the late Mr. L. M. Loomis of California, the Boston Museum of Natural History, the Charleston Museum, and more than a hundred college and other students.

[The following list contains 220 named forms.—Ed.]

HORNED GREBE. *Colymbus auritus.* One taken by Loomis at Chester, March 4, 1880.

PIED-BILLED GREBE. *Podilymbus podiceps.* Fairly common yearly resident.

COMMON LOON. *Gavia immer.* Occasional in winter on larger bodies of water.

RED-THROATED LOON. *Gavia stellata.* I have seen this form only on the coast, but Loomis records a specimen for Chester, February 28, 1885.

BRUNNICH'S MURRE. *Uria lomvia lomvia.* Accidental at Anderson. One taken by J. R. Nowell and brother, December 19, 1896. Recorded by Elliott Coues in the *Auk.*

HERRING GULL. *Larus argentatus.* Around larger bodies of water occasionally.

BLACK TERN. *Chlidonias nigra surinamensis.* One, taken on Saluda in upper Piedmont, was mounted by David Smith of Greenville, S. C.

BLACK SKIMMER. *Rynchops nigra.* Accidental at Chester, September 10, 1880. By Loomis.

YELLOW-BILLED TROPIC-BIRD. *Phaethon americanus.* Accidental at Jocassee in the mountains, July 30, 1926. Recorded in the *Auk* by A. T. Wayne and F. Sherman.

HOODED MERGANSER. *Lophodytes cucullatus.* Winter resident in lower Piedmont.

MALLARD. *Anas platyrhynchos.* Common winter resident.

BALDPATE. *Mareca americana.* Winter resident in lower Piedmont.

GREEN-WINGED TEAL. *Nettion carolinense.* Winter resident.

BLUE-WINGED TEAL. *Querquedula discors.* Common winter resident.

SHOVELLER. *Spatula clypeata.* In winter in lower Piedmont.

PINTAIL. *Dafila acuta tzitzihoa.* One record from Loomis at Chester, March 12, 1883, and recently recorded near Greenville by myself.

Wood Duck. *Aix sponsa.* Resident throughout the year.

Redhead. *Marila americana.* In winter in lower Piedmont.

Lesser Scaup Duck. *Marila affinis.* Winter resident.

Ring-necked Duck. *Marila collaris.* Winter resident.

Buffle-head. *Charitonetta albeola.* In lower Piedmont in winter.

Ruddy Duck. *Erismatura jamaicensis.* Recorded near fall-line by Dr. Thos. Smyth, in the *Auk*, April, 1926, but not taken.

Canada Goose. *Branta canadensis canadensis.* Fairly common in winter.

Whistling Swan. *Cygnus columbianus.* All records from lower Piedmont.

Wood Ibis. *Mycteria americana.* Recorded only near the fall-line.

American Bittern. *Botaurus lentiginosus.* Winter resident.

Least Bittern. *Ixobrychus exilis.* Summer resident and breeder. Mr. Wm. Hahn, Jr., found a nest near Greenwood in May, 1923.

Great Blue Heron. *Ardea herodias herodias.* Found in summer even in the mountains, and in lower Piedmont in winter.

Egret. *Casmerodius egretta.* Recorded by Loomis in lower Piedmont. Not common.

Little Blue Heron. *Florida caerula.* Young white birds are seen in summer to the foot of the mountains. The blue and mixed phases I have found later in the summer below the fall-line.

Little Green Heron. *Butorides viriscens viriscens.* Common in summer.

Black-crowned Night Heron. *Nycticorax nycticorax naevius.* Rather common in spring and autumn, and fairly so during summer.

King Rail. *Rallus elegans.* Summer resident; not very common. Wm. Hahn, Jr., found nests in the lower Piedmont near Greenwood. in 1924 and 1926.

Virginia Rail. *Rallus virginiana.* Winter resident.

Sora. *Porzana carolina.* Migrant.

Yellow Rail. *Corturnicops noveboracensis.* Migrant in lower Piedmont.

Black Rail. *Cresciscus jamaicensis.* One found by Loomis. Chester, September 3, 1887.

Florida Gallinule. *Gallinula chloropus cachinans.* Summer resident.

Coot. *Fulica americana.* Found during migration in both upper and lower Piedmont.

NORTHERN PHALAROPE. *Lobipes lobatus.* Accidental at Chester, May 17, 1880. (Loomis).

WOODCOCK. *Rubicola minor.* Yearly resident; not common.

WILSON'S SNIPE. *Gallinago delicata.* Winter resident; common during migrations.

PECTORAL SANDPIPER. *Pisobia maculata.* Two recorded for Chester by Loomis, October 10, 1878.

LEAST SANDPIPER. *Pisobia minutilla.* Recorded as migrant by Loomis at Chester.

GREATER YELLOW-LEGS. *Totanus melanoleucus.* Seven at Chester, April 21, 1880.

YELLOW-LEGS. *Totanus flavipes.* One recorded, August 8, 1877, by Loomis as Chester.

SOLITARY SANDPIPER. *Tringa solitaria solitaria.* Common migrant in the lower Piedmont. Also found in summer.

UPLAND PLOVER. *Bartramia longicauda.* Migrant in lower Piedmont, and perhaps less frequently near the mountains.

SPOTTED SANDPIPER. *Actitis macularia.* Chiefly a spring migrant; less common in the fall; in mountains, about ponds, during summer. I noted it about an artificial lake near Little Rich Mountain in July, 1927.

GOLDEN PLOVER. *Pluvialis dominica dominica.* One was taken by Loomis, at Chester, September 19, 1877.

KILLDEER. *Oxyechus vociferus.* Common throughout the year.

BOB-WHITE. *Colinus virginianus virginianus.* Common yearly resident.

RUFFED GROUSE. *Bonasa umbellus umbellus.* Yearly resident in the mountains, where it has been more or less restricted by deforestation of the lower lands.

WILD TURKEY. *Meleagris gallopavo silvestris.* Quite extinct in upper South Carolina, except for some possible localities in the mountains.

ENGLISH RING-NECKED PHEASANT. *Phasianus colchicus x torquatus.* Introduced.

PASSENGER PIGEON. *Ectopistes migratorius.* Extinct. Once found in the mountains even in the summer; A. T. Wayne observed two pairs at Caesar's Head in the summer of 1882.

MOURNING DOVE. *Zenaidura macroura carolinensis.* Common yearly resident.

TURKEY VULTURE. *Cathartes aura septentrionalis.* Yearly resident; more common in mountains and upper Piedmont.

Black Vulture. *Coragyps urubu.* Yearly resident. More common in lower hills.

Swallow-tailed Kite. *Elanoides forficatus.* Rare, but general in summer.

Marsh Hawk. *Circus hudsonius.* Fairly common in winter in lower Piedmont.

Sharp-shinned Hawk. *Accipiter velox.* Yearly resident.

Cooper's Hawk. *Accipiter cooperi.* Yearly resident, but commoner during the migrations and in winter.

Red-tailed Hawk. *Buteo borealis borealis.* Yearly resident. Common.

Red-shouldered Hawk. *Buteo lineatus lineatus.* Yearly resident. More common during migrations. The Florida variety, *B. l. alleni*, probably occurs in the lower Piedmont, a nest found by Mr. Hahn appearing to be of such a bird.

Broad-winged Hawk. *Buteo platypterus.* Yearly resident. Mr. Hahn reports a nest near Greenwood, April 21, 1926.

Golden Eagle. *Aquila chrysaetes.* Occasional throughout territory, possibly still breeding in the mountains nearby.

Bald Eagle. *Haliaeetus leucocephalus leucocephalus.* Occurs at times.

Duck Hawk. *Falco peregrinus anatum.* Formerly bred in the mountains and may still do so.

Pigeon Hawk. *Falco columbarius columbarius.* Not a common migrant.

Sparrow Hawk. *Cerchneis sparveria sparveria.* Common yearly resident.

Osprey. *Pandion haliaetus carolinensis.* Found along larger streams in summer even into the mountains.

Barn Owl. *Tyto alba pratincola.* Fairly common yearly resident. Chiefly reported from the lower Piedmont.

Long-eared Owl. *Asio otus wilsonianus.* Winter resident.

Short-eared Owl. *Asio flammeus.* Winter resident.

Barred Owl. *Strix varia varia.* Yearly resident. Next to following, most common.

Screech Owl. *Otus asio asio.* Very common throughout the year. The Florida variety, *O. a. floridanus*, occurs along the Savannah into the lower Piedmont, according to Wayne.

Great Horned Owl. *Bubo virginianus virginianus.* Once common, is being driven into the more heavily forested regions of the mountains and coast-plain.

Snowy Owl. *Nyctea nyctea.* Occasional in the winter.

Carolina Paroquet. *Conuropsis carolinensis.* Extinct.

Yellow-billed Cuckoo. *Coccyzus americanus americanus.* Common in summer.

Black-billed Cuckoo. *Coccyzus erythropthalmus.* A migrant which I have noted only in spring, one each in Anderson, Greenville, and Pickens Counties. Loomis records two at Chester. Coues, at Columbia, stated it was rarely seen.

Belted Kingfisher. *Ceryle alcyon.* Throughout year; more common in summer.

Southern Hairy Woodpecker. *Dryobates villosus auduboni.* Common yearly resident. This and the next, both Austroriparian, occur to the summit of the mountains.

Southern Downy Woodpecker. *Dryobates pubescens pubescens.* Common yearly resident.

Red-cockaded Woodpecker. *Dryobates borealis.* Near fall-line. Austroriparian.

Yellow-bellied Sapsucker. *Sphyrapicus varius varius.* Common winter resident.

Pileated Woodpecker. *Phloeotomus pileatus pileatus.* Common yearly resident. Another Austroriparian form occurring to the summit of the mountains.

Red-headed Woodpecker. *Melanerpes erythrocephalus.* Common in summer, and found locally in the winter.

Red-bellied Woodpecker. *Centurus carolinus.* Common in winter in Piedmont; not so often seen in summer, probably retiring to denser forests.

Northern Flicker. *Colaptes auratus luteus.* This form is found in the Piedmont even down to the fall-line, apparently blending in the lower Piedmont with the next following.

Southern Flicker. *Colaptes auratus auratus.* Yearly resident.

Chuck-will's Widow. *Antrostomus carolinensis.* This Austroriparian form is common in summer, to the very foot of, and even into the valleys of the mountains.

Whip-poor-will. *Antrostomus vociferus vociferus.* Once common in summer in the Piedmont, deforestation is apparently pushing it back into the mountains where it breeds, occurring farther down the country as a migrant.

Nighthawk. *Chordeiles virginianus virginianus.* Common summer resident.

[To be continued]

THE WILSON BULLETIN

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EDITORIAL

LATE in June the Editor drove by automobile over seven hundred miles of highway in northwestern Iowa. Two observations were made, one concerning the Bobolink, and the other concerning the Red-headed Woodpecker.

During the entire trip only four Bobolinks were seen. Ten years ago through the same territory we would have expected to see upwards of fifty of these birds. Our immediate conclusion is that the marked decrease in numbers of the Bobolink in this part of the country is the result of their slaughter in the south under government permit.

On one part of the drive, covering about 150 miles, our attention was drawn to the number of Red-headed Woodpeckers dead in the road. Seven were casually noted in this one section of driving. These birds were fresh enough to be easily identified without stopping the car. Doubtless a week's traffic would so obliterate the plumage that recognition might be much more difficult. Many of the highways are also dragged as often as once a week. We may assume, perhaps with fair accuracy, that each week discloses a new crop of highway cadavers. A very interesting and valuable mortality study might be made by one who is so situated as to be able to make a census on a given stretch of highway once a week, with fair regularity throughout the summer. To make the record satisfactory all cadavers, of birds at least, should be gathered up; two important ends would be served by this procedure, namely, the reliable identification of the specimens, and the prevention of duplication of count in a succeeding census.

The following short, and possibly incomplete, bibliography on the subject of highway mortality may be of interest to some readers:

Stoner: *Science*, LXI, January 16, 1925. Pp. 56-57.
Dill: *Science*, LXIII. January 15, 1926. Pp.
Baldwin: *Science*, LXIII, April 2. 1926. Pp. 358-359.
Flint: *Science*, LXIII, April 23, 1926. Pp. 426-427.
Neff: *Oologist*, XLIII, April, 1926. Pp. 55-59.
A. H. H.: *Bird-lore*, XXVIII, July-August, 1926. Pp. 314-315.
Blocher: *Oologist*, XLIII, May, 1926. Pp. 66-67.
Burr: *Science*, LXIII, No. 1638, 1926. P. 524.
A. H. H.: *Bird-Lore*, XXIX, No. 5 1927. Pp. 391-392.
Grant: *Fins, Feathers and Fur*, No. 53, 1927. P. 213.

QUITE recently there was founded in this country a society to be devoted to the study and propagation of exotic birds in captivity, and their preservation from

extinction. It is called the Avicultural Society of America, and proposes to work along lines similar to the Avicultural Society of England. The Society has already undertaken extensive co-operative work with the different species of the Parrakeet, as described by C. T. Metzger in the July-August *Condor*. If any of our readers are interested in such an organization they may secure information from Mr. Chas. T. Metzger, Secretary, 6312 South Ashland Ave., Chicago, Ill.

Most of our readers will remember that the United States Senate passed on April 18 last, an act known as the "Migratory Bird Conservation Act," or simply as the Norbeck Bill (S. 1271). There is also before Congress another bill commonly known as the Anthony Bill (H. R. 5467), which is essentially the old Marshland Conservation Bill, Public Shooting Grounds Bill, etc., with which everyone is familiar. The Anthony Bill provides for a hunter's license fee, and the shooting of game on the refuges to be established under the bill. The Norbeck Bill eliminates the hunter's license fee and substitutes federal appropriation; eliminates the public shooting grounds scheme and substitutes inviolate sanctuaries for game.

We have never been so sharply opposed to the federal license fee idea as some have been; and yet this principle seems to be closely linked with the shooting grounds principle. For, if the hunter pays the government for a license to shoot game, he may, with some justification, expect that money to be applied to the maintenance of shooting grounds stocked with game. On the other hand, under the Norbeck Bill, the government accepts none of the shooter's money, and is, therefore, under no obligation to provide sport, directly. Under this plan the government's sole purpose is to preserve the game—to prevent or retard extermination; at the same time, of course, indirectly preserving the sport of hunting. It seems to us that this plan is infinitely the better one.

We therefore favor the Norbeck Bill, and believe that every true conservationist and friend of wild life should make some effort to secure its passage in the House of Representatives this fall, without amendment or alteration.

Through inadvertence the legends for the figures in Mr. Sutton's paper on a collection of hawks from Pennsylvania, which was published in the last (June) issue of the Bulletin, were omitted. All of the figures showed the tails of Sharp-shinned Hawks, the first eight figures being of males and the last three being of females. We give below the complete legends for all the figures, as shown in the three cuts:

Fig. 1. An individual probably more than two years old. Note that rectrices are of the same length, that barring of outer rectrices is the same as that of the other rectrices, and that the tips of all rectrices are similar in shape.

Fig. 2. An individual probably in the first breeding plumage. Note that there are more bars on the outer than on other rectrices, and that barring is bilaterally asymmetrical.

Fig. 3. An individual probably in first breeding plumage. Note that there are more bars on the outer than on the other rectrices; that barring is bilaterally asymmetrical; and that the outer rectrices are noticeably longer than others, and with tips of different shape.

Fig. 4. An individual probably in first breeding plumage. Note the unusual number and shape of bars on outer rectrices.

Fig. 5. An individual probably in first breeding plumage. Note unusual bilateral asymmetry of barring, and difference in number of bars on inner and outer rectrices.

Fig. 6. A juvenal. Note large number of bars on outer rectrices, and difference in position of distal bar in other rectrices.

Fig. 7. A juvenal. Note tendency of tip toward rounded pattern of *A. cooperi.*

Fig. 8. A juvenal. Note bilaterally asymmetrical and somewhat abortive barring. Note also pointed character of tip of outer rectrix.

Fig. 9. A juvenal. Note asymmetrical barring, particularly of rectrix adjacent to the outer; note also the tendency of tip toward rounded pattern of *A. cooperi.*

Fig. 10. An individual probably in first breeding plumage. Note bilateral asymmetry of barring, and tendency of tip toward pattern of *A. cooperi.*

Fig. 11. An individual probably in first breeding plumage. Note tendency of tip toward rounded pattern of *A. cooperi.*

WITHOUT special legislative action a precedent has become pretty well established of holding our annual meeting in conjunction with the American Association for the Advancement of Science when the latter meets in the territory of the W. O. C. This custom has simply grown, and there are several reasons for it.

In the first place such a connection gave us a great deal of moral support in the past years when we especially needed it; and we may not be wholly past that period yet. We find that such an arrangement is very satisfactory to teachers, of whom there are a great many in our membership. It enables them to attend their professional meeting and the W. O. C. meeting on one journey. We also find that our meetings are always sure of a nucleus of attendance from this source.

When we meet with the A. A. A. S. we are always sure of the reduced railroad fare of one and a half for the round trip. This means a great deal to many who attend the meetings, and without it our attendance would certainly suffer to some extent. By going with the A. A. A. S. we are taken into new localities where we may have few or no members, and where we could not otherwise expect an invitation. Where we have no local committee of our own the A. A. A. S. makes all arrangements for a meeting place, and prints our program.

These are a few of the more cogent reasons for continuing our relations with the A. A. A. S. In accordance with this policy we should be due to meet in Des Moines in 1929; Cleveland in 1930; New Orleans in 1931; and Chicago in 1932. An invitation to meet in Des Moines in 1929 was received at the Nashville meeting. We understand also that the Chicago Academy of Sciences has extended an invitation to hold our 1932 meeting there. They have been our excellent hosts on two previous occasions. We should be ready to accept this

invitation unless it should seem more advisable to hold our meeting on the South Side, at the University, where the general meetings will likely be held.

One of our greatest difficulties in the past has been too much delay in completing the meeting arrangements. We are glad, therefore, to note a tendency on the part of prospective hosts to extend an invitation a couple of years in advance. In fact, Nashville repeated the invitation annually for three years in advance of the first meeting held there. When we meet with the A. A. A. S. a local invitation is not necessary, but is appreciated nevertheless. In recent years our meetings have been well attended, and our programs have been excellent, amply repaying those in attendance. We also believe that the meetings stimulate local interest in our field of scientific work. Our territory is extensive, and it is to our advantage to place the meetings in all parts of it.

THE ANNUAL MEETING AT ANN ARBOR

THE DATES of the annual meeting have been set for the two days following Thanksgiving Day, namely, November 30 and December 1, at Ann Arbor, Michigan. The sessions will be held in the new building of the Museum of Zoology of the University of Michigan.

It is expected that the two days will be devoted to the formal programs, and if any field work is done, it will probably be on December 2. Considerable time will be desired by many of those in attendance for an inspection of the magnificent new Museum Building in which our meetings will be held.

In June of the present year the University of Michigan completed and opened a new and large building for the Museum of Zoology. This building is undoubtedly one of the finest in the country for museum purposes. The W. O. C. may consider it a real privilege and honor to be one of the first among the scientific societies to hold a meeting here. Much of the credit for the new Museum belongs to Dr. Alexander G. Ruthven, Director of the Museum, and also recently made Dean of Administration of the University.

There are several reasons for believing that the Ann Arbor meeting will be unusually well attended. In the first place we have forty-six members in Michigan, and we expect them all to attend. Ann Arbor is easily reached from points in Pennsylvania, Ohio, Indiana, and Illinois, and we expect a little better than the usual attendance from these states. There will undoubtedly be some representation from the south and from west of the Mississippi River. In addition, the Inland Bird Banding Association will hold its annual meeting at the same time. So we confidently believe that our next meeting will have a larger attendance than any previous one. The officers will soon be at work on the program, and we urge our members to make an early report to the Secretary concerning any contribution to the program.

GENERAL NOTES

Conducted by M. H. Swenk

The Golden Eagle in Indiana.—From time to time eagles are reported as having been killed in various parts of Indiana, but in most instances verification is lacking even when inquiry is made to establish identification. The Golden Eagle (*Aquila chrysaetos*) is much rarer than the Bald Eagle (*Ha'iaeetus leucocephalus leucocephalus*) throughout our region. I now record two verified reports of the Golden Eagle. Dr. Earl Brooks at Noblesville, Indiana, had a bird of this species brought to him for identification on November 30, 1926, and on December 28, 1927, an immature Golden Eagle was shot in Brown County, about fifty miles south of Indianapolis, and was first taken to Edinburg and then brought to Indianapolis, where proper identification was made. The bird was mounted and photographed, and is now in the high school building at Edinburg. It had a wide spread of more than six feet and had a band of dirty white about five inches in width across the entire upper part of the tail.—S. E. Perkins III, *Indianapolis, Ind.*

How Did This Happen?—A pair of Phoebes (*Sayornis phoebe*), nesting on the cross-bracing of the ceiling joist of the garage, just over the entrance where the cars were being run in and out every few minutes, hatched a Cowbird (*Molothrus ater ater*). This youngster quickly tired of the insect diet given by his foster parents, and shortly after leaving the nest began feeding on seeds in the traps, becoming, finally, a nuisance as he entered them several times daily.

After several days of this we took him "for a ride", well covered to prevent his seeing, and liberated him about a mile from home, only to find him again the next morning feeding contentedly in one of the traps. Another ride of two miles had the same results, and only after taking him out some several miles, and turning him loose with a flock of his own kind, did we get rid of him.

How did this recently born bird, fostered by other than his own kind, never before off the home lot, find his way back so quickly and all by himself, with no guides?—Edward A. Everett, *Waseca, Minn.*

A Note on the Food of Young Great Horned Owls—There recently has come to my attention an interesting study of the food of young Great Horned Owls (*Bubo virginianus virginianus*) made at Mont Alto, Franklin County, Pennsylvania, by Mr. Leonard A. Prichard of the Mont Alto State Forestry School.

Mr. Prichard examined the nest daily from March 11 to April 11, 1927, and, as the following table shows, food of some sort was found on virtually every trip. Two young birds were in the nest. Examination was made in the morning, presumably after most of the night-time feeding was over, so it may properly be inferred that many mice, shrews, chipmunks, and small birds were devoured so completely that no remains were evident. No pellets were examined. The results of these examinations follow:

March 11, adult Cottontail Rabbit remains; March 12, same; March 13, same; March 14, same; March 15, nest empty; March 16, same; March 17, immature Cottontail Rabbit remains; March 18, Flicker; March 19, small bird, species uncertain; March 20, adult Cottontail Rabbit; March 21, adult Cottontail Rabbit, Robin (headless), and Slate-colored Junco; March 22, small bird, species uncertain; March 23, adult Cottontail Rabbit; March 24, same; March 25, nest empty; March 26, adult Cottontail Rabbit remains; March 27, same;

March 28, nest empty; March 29, adult Cottontail Rabbit remains; March 30, nest empty; March 31, adult Cottontail Rabbit; April 1, same; April 2, same; April 3, adult Cottontail Rabbit and Robin; April 4, nest empty; April 5, Robin and Flicker; April 6, Robin; April 7, adult Cottontail Rabbit; April 8, nest empty; April 9, adult Skunk; April 10, nest empty; and April 11, Robin.

It is evident that Cottontail Rabbits form a large portion of the food of the young birds prior to the warm days of early April. With the return of spring, however, birds at once become a prominent item in the bill-of-fare. The Skunk found on April 9 is of interest since it shows that the young birds, as well as the adults, eat this mammal occasionally.

From the standpoint of the farmer and orchardist, the rabbit-killing propensities of this predator are laudable; the sportsman, however, will regard the owl as an undesirable killer of birds and game.—GEORGE MIKSCH SUTTON, *Game Commission, Harrisburg, Pa.*

The Cliff Swallow in Clayton County, Iowa.—Some decades ago the Cliff Swallow (*Petrochelidon lunifrons lunifrons*) was a common breeder here, and old-timers tell of the barns being lined with nests. In late years nesting records have been few and far between. On June 15, 1927, Miss Althea R. Sherman and the writer visited the largest breeding colony found here in years. The nests were built on the corn-crib on the farm of Mr. Albert O. Berns, near National, Iowa. Twenty-five were on the east side of the building and two on the opposite side. Three were double, but lack of room cannot be considered as a cause. Seven nests were not completed, ranging from a few smears of mud to nests that were half finished. Building was reported to have commenced on May 19. Several nests were being used by English Sparrows, and some of the Cliff Swallows were reported to have left the vicinity.—OSCAR P. ALLERT, *McGregor, Iowa.*

A Possible Relationship Between Bell's Vireo and the Cowbird.—While on a bird study trip with a class on June 23, 1927, we were attracted by the notes of Bell's Vireo (*Vireo belli belli*), sung in the trees and bushes along a small ravine at the northwest edge of Stillwater. Upon following these birds (a pair) we found ten nests, all constructed in the same manner and of much the same material. All were located within one hundred yards of the first one found. One nest had a Cowbird egg only; one had a vireo egg and a Cowbird egg; one had a vireo egg; another had two dead vireos (young) and one vireo egg that had not hatched; the others were empty.

From all appearances the nests were all built that season. One nest was so high in a slender bush that we could not see into it.

The incident suggests to me the possibility that Bell's Vireo leaves its nest when bothered by the Cowbird, moves over to a new site and builds a new nest. There were only the two vireos in the ravine.—GEORGE A. MOORE, *Stillwater, Okla.*

Regarding a Late Florida Record of the Flamingo.—In the *Auk*, XLV, p. 201, April, 1928, Mr. H. L. Stoddard records seeing a Flamingo on September 24, 1927, on the Gulf Coast of Florida. Late records of this bird in Florida are worthy of note, but, without detracting from Mr. Stoddard's efforts, I think it is only right to advance the theory that this bird is evidently the one that escaped from the preserve of Mr. Edward Bok, at Mountain Lake Park, Lake Wales, Florida, in late February or early March of 1927.

Soon after it got away, Mrs. Bok wrote me, asking if I had heard anything from it, and if possible to have it returned to their sanctuary. Of the other caged birds that escaped in this section during the hurricane of 1926, two were later seen, and one was captured over six months later.

It would be natural for the Bok bird to work south with the other water birds during the early fall; and, having been in confinement for some time previously, it naturally would not migrate southward to Cuba or the Bahamas in one flight. The light color of the plumage, as noted by Mr. Stoddard, and the nearness of approach allowed by the bird, also indicates it to be the Bok or some other escaped caged bird.—Harold H. Bailey, *Miami, Fla.*

The European Starling Nesting at Nashville, Tennessee—In the Wilson Bulletin for September, 1925, I recorded the European Starling (*Sturnus vulgaris*) as breeding at Bristol and at Knoxville, Tennessee, during May, 1925. About the first of June, 1927, Messrs. G. R. Mayfield and Vernon Sharp observed a pair in a pasture at Woodbury, forty miles southeast of Nashville, this date being reasonable evidence of their breeding. On March 24, 1928, in passing the same place, I observed two pairs going in and out of old Flicker holes in a dead tree, and presumed that they were making ready to nest.

On April 27, 1928, at Nashville, I observed several Starlings feeding in a pasture with Grackles, Meadowlarks and Robins. Realizing that this date meant nearby nests, I returned the next day to "sit it out" with them, so as to locate their breeding place. I did not have long to wait, for soon one of them made off in a low straight flight and dived into an old Flicker's hole in a telephone pole some forty feet from the ground. Within a half hour I located the nests of the other two pairs, also in old woodpecker holes in telephone poles, nine and twenty feet up, respectively.

Ascending the poles I enlarged the openings with a chisel and in the first nest found six young about ten days old, in the second were five young a week old and in the third were five young about five days old. Later in the day, I met Prof. J. M. Shaver who told me that he had just observed Starlings carrying food to young in three nests at another locality, some distance from where I had found mine.

Migrating Starlings were particularly abundant here this year, from January to the latter part of March; so abundant in fact that I felt sure that a number would remain to breed.—Albert F. Ganier, *Nashville, Tenn.*

Banding Robins in Florida.—The Banding of Robins was carried on around my place at Pass-a-Grille, Florida, during the week ending March 5, 1928, when a total of sixty-five Robins had ben banded. I have measured some of the wings, and most of them appear to be northern birds. Today one female measured had a wing 120 mm. long, which I believe, together with the paleness of the bird, indicates a Southern Robin. Never before in my Florida experience of six seasons have there been so many Robins as this past winter. In April I made some cross sections of the Robin flocks, which covered a territory two and a half miles long on this island, and placed the number at 11,000 and with them about 4,000 Myrtle Warblers. The movement northward was apparent for some weeks prior to March 5, by which date onlyy stragglers were lingering. They swarm where any fresh water is available in this region of salt water.—Wm. G. Fargo, *Jackkson, Mich.*

An Unusual Flight of Geese.—It may be common in some parts of the country for immense flocks of geese to pass by on migrations—the writers cannot be positive of that—but it is very uncommon in Iowa, Nebraska, or the Middle West for six or seven thousand geese to pass over in a few hours.

Such was the experience of the writers on March 14, 1928, between the hours of 7 A. M. and 1 P. M., in South Dakota across the Big Sioux River west of Sioux City, Iowa. It seemed to be one continuous procession of flocks going northward, flying high or low, but never stopping on the partly ice-covered lakes of the region.

Four species of geese were noted: White-fronted Goose, 2; Blue Goose, 3805; Snow Goose, 668; Canada Goose, 2386; and unidentified geese, 316 indi-

Flocks of Blue Geese on March 18, 1928

viduals. The total number of all species was 7177. Flocks varied in size from a few to over a thousand. Snow Geese were never seen in flocks by themselves but were scattered in flocks of other species. The two White-fronted Geese were in a large flock of Canada Geese with a few Snow Geese included.

Flocks could be heard long before coming into sight. It was noteworthy that the Canada Geese flapped their wings much slower than other species, and also appeared to maintain their flock formations better.

Never, within the knowledge of bird students of the Sioux City locality, has there been as many geese seen in one day and the big, unanswered question is, what was the reason for such a large number at that time.—WALTER M. ROSEN and WALTER W. BENNETT, *Sioux City, Iowa.*

Increase of Blue Geese in the Missouri Valley.—On March 18, 1928, I had the pleasure of being in the field with Mr. Bennett and Mr. Youngworth, on the Missouri River bottoms, about twenty miles south of Sioux City. The trip was taken especially to see the geese, which had been reported to us. The geese were too numerous to count, or even to estimate with very great accuracy. But the writer put down the following figures for the Blue Goose: 1500, 250, 500, 4000, 300, 4000; and the following figures for the Snow Goose: 6, 100, 40, 100. These figures refer to birds in the air, except the two counts of 4000 for the Blue Goose, and the two of 100 for the Snow Goose. Those in flight were in many flocks of varying size, some of which undoubtedly contained one or two

hundred birds. In both cases the 4000 Blue Geese were flocks at rest in a shallow slough or mud flat. Among these were Snow Geese, estimated at 100 in each case. These birds were simply standing at ease. There was more or less commotion in places from time to time, and in the second large resting group, geese were constantly arriving in small flocks from the direction of the first large flock; when we first came upon the second flock it contained at least 2000, possibly 3000, geese, and hence was in addition to the first large flock of 4000. No Canada Geese or White-fronted Geese were seen among these resting flocks, nor did we see any Canada Geese flying with the Blue Geese; but the Snow Geese and Blue Geese were always intermingled, the latter far outnumbering the former.

On the way home, toward evening, we saw a great flock coming from the direction of the slough, and saw them alight in a stubble corn field, where they began to feed, apparently on stray kernels of corn. Flocks continued to come in and alight, making a column of geese numbering, perhaps, 1500. The column proceded through the field, at times approaching within a hundred yards of the highway, where twenty-five or thirty automobiles were parked to enable the occupants to view the unusual sight. These birds are not included in the figures, because we assumed that they came from the flocks already counted.

I have never before seen or heard of such numbers of Blue Geese migrating through this part of the country. It is probably the result of adequate protection in the winter quarters in the south together with spring protection. Their far north breeding ground renders them practically immune during that season. I have not heard of any corresponding increase in the number of Canada Geese.—T. C. Stephens, *Sioux City, Iowa.*

Actions of a Young Wilson's Plover.—On June 26, 1927, I visited a colony of Least Terns which were nesting on a sand-bar close to the shore on the Indian River, right in the city of Titusville, Brevard County, Florida. While looking for types of Least Tern eggs new to me, I caught sight of a fleeting, small object near to the edge of the water, and, suspecting it to be a young Least Tern, I went to the spot where it was last seen. Here, crouched upon the ground among shells and debris, was a young Wilson's Plover about five days old. It lay with its head and neck lying on the ground, and as I stooped to pick it up it dashed away with remarkable speed. I gave chase, and when close upon it it dodged between my legs. This was repeated a number of times before I was able to catch the nimble little fellow. When captured it cried loudly, and struggled to escape. As I was chasing the young the parents flew toward the spot with sharp cries, and alighted within a few feet of me, uttering their plaintive cries while they dragged their wings along the ground, with the feathers of their backs raised.

It was such a splendid opportunity to secure good poses at close range that I decided to go for my camera in the car a few hundred feet away, so I put the young plover under a shell of a Horse-shoe or King Crab, placing wet sand around the edges to keep it from escaping. Returning shortly, I found the young lying quietly beneath the shell. It commenced to cry out as I held it, thus attracting the parents once more, but this time they did not offer anything near the previous chances to take good pictures, so I gave it up and endeavored to get one of the young. But every time I got a focus it would dive off, and right after it I went. Finally, it made its escape to the water, running out as

far as it could and then swimming five or six feet until it reached a submerged log. It lay within a few inches of the log, with its neck and head resting flat upon the surface, in the shadow. A more effective concealment could not have been found. I crept up easily to take a picture, but, sensing its detection, it swam off in a wide circle, then made rapid strokes for shore. While I was maneuvering with the Graflex it gained the shore and when I looked around it was nowhere in sight. I never saw it again.

The young of the Least Terns that were old enough to leave the nests were found hiding under the small green weeds, on the sand-bar, which afforded them shade and concealment.—DONALD J. NICHOLSON, *Orlando, Fla.*

Some New Bird Records for North Dakota.— Trumpeter Swan (*Olor buccinator*).—On April 25, 1928, a pair of Trumpeter Swans were seen on Slades Lake, a few miles southeast of Dawson, North Dakota, by Lee Pettibone. These swans were in company with a flock of 125 Whistling Swans, but kept off to themselves. Their large size, in comparison with the Whistling Swan, was very noticeable. The difference in their call notes was also observed.. Mr. Pettibone is an old and well known bird student, and his observations can be relied upon. Trumpeter Swans are now so scarce that any note of them is of sufficient importance to record.

Little Blue Heron (*Florida caerulea*).—The North Dakota Historical Society now has a mounted specimen of an immature Little Blue Heron, which was taken near Sims, North Dakota, about forty miles west of Bismarck, in the fall of 1914. The bird was taken by Mr. August Timmerman of Mandan, North Dakota, and was thought to be a White Egret. I do not believe that there is a published record of this species for the state.

White Gryfa'con (*Falco islandus*).—While visiting the taxidermist shop of J. D. Allen of Mandan, North Dakota, I was attracted by a large white hawk. Upon closer examination the bird proved to be a White Gyrfalcon. Mr. Allen sta'ed that the bird had been sent and later sold to him by Zepphon M. Smith of Buffalo, North Dakota. By correspondence with Mr. Smith, I found that the bird had been taken at his farm six miles northeast of Buffalo, on or about the first of December, 1922. Noticing his Belgium pigeons very much excited over something, he went outside to investigate. He found the gryfalcon making repeated dashes to catch them. It was not at all shy and he had no difficulty in shooting it. Unfortunately the sex of the bird was not noted, but judging from its size and coloration it is probably a young female. The mounted specimen is now preserved in the collection of the North Dakota State Historical Society. As far as I am aware this is the first record for the state.

Brewer's Sparrow (*Spizella breweri*).—On May 28, 1928, while on a visit to the Bad Lands about eighteen miles south of Marmarth, North Dakota, I was attracted by a small sparrow singing from the sage brush. It was a new song to me, so after some difficulty, due to the approaching darkness, I was able to secure a specimen. Upon examination it proved to be a Brewer's Sparrow. On the following day I saw and heard several of these birds a few miles west of Marmarth. As far as I am aware this species is not given in any of the state lists.

Blue-headed Vireo (*Lanivireo solitarius solitarius*).—On May 24, 1927, the writer secured a fine male specimen of the Blue-headed Vireo at Bismarck, North

Dakota. As this species is rare in the extreme eastern part of the state, and none have been reported for the central west portion, this capture seems to be worth recording. The specimen is now in the collection of the North Dakota State Historical Society at Bismarck.—Russell Reid, *North Dakota State Historical Society, Bismarck, N. Dak.*

Ring-necked Pheasant vs. Bull Snake.—Recently, while passing the farm of John Welke, located eight miles southeast of Redfield, I saw a female Ring-necked Pheasant (*Phasianus torquatus*) giving battle over its nest with a three-foot Bull Snake (*Pituophis sayi*). The male pheasant was near by, watching the conflict but not participating in it. The hen pheasant would strikek at the snake, and then the snake would strike back at the pheasant. After watching this battle for a time, I approached to get closer to the contestants, when both of the pheasants flew away. I then examined the Bull Snake, and found it to be very weak. I think the pheasant would have had no trouble in eventually killing it. I finished killing the snakek before I left. On other occasions I have witnessed other fights between Ring-necked Pheasants and different kinds of birds and animals.—Claude McCurdy, *Redfield, S. D.*

A Brown Thrasher Feeds a Snake to Its Young.—On the afternoon of May 24, 1928, from my window I saw a Brown Thrasher with a snake ten to twelve inches long in its beak. The snake was very much alive, and was twisting about trying to escape.. The thrasher held on to it, beating it against the ground, and then striking it with its beak, until the snake ceased to struggle. A young bird was close by, watching and begging for food. After the snake was apparently dead the thrasher flew with it to a bare spot of ground a few feet farther from the window, where there were small stones, and beat the snake against these. The young bird followed, eager for a bite, and was fed several bits. Then for a moment both birds appeared to be pulling on the snake. The parent let go and the young bird began swallowing the remainder of the snake, a piece five or six inches long. It was hard work, especially the last inch, which protruded from its mouth for several minutes, but that also finally disappeared and the young bird once more started tagging its parent.—Beryl T. Mounts, *Macon, Ga.*

English Sparrows Nesting in the Homes of Cliff Swallows.—In the March number of the Wilson Bulletin (p. 50), Dr. F. L. R. and Mary Roberts mentioned the Cliff Swallows (*Petrochelidon lunifrons lunifrons*) nesting along a gorge of the Big Sioux River, near Dell Rapids, South Dakota. A party from this institution visited the colony in the hope of securing motion pictures of the nesting birds, but it was found that most of the nests were inaccessible. The site referred to by Dr. Roberts as being accessible for photographs was not being used, and the old nests were occupied by the English Sparrows. Many sparrows were seen entering with nesting material.—Alfred M. Bailey. *Chicago Academy of Sciences, Chicago, Ill.*

[Editor's Note.—Following the receipt of the preceding note from Mr. Bailey, the Editor communicated with Dr. Roberts and both made a trip to the "Dells" in South Dakota on July 14-15. We found conditions just as described by Mr. Bailey, although we estimated that about 200 Cliff Swallows were flying over the river. An attempt was made to count the nests occupied by the swallows; by using a boat on the river we counted well over a hundred nests. Some nests were being used by English Sparrows, but we could not ascertain whether the swallows had abandoned them or had been driven out.—T. C. S.]

BIRD BANDING NEWS

Conducted by W. I. Lyon

TRAPS FOR BIRD BANDING

BY W. I. LYON

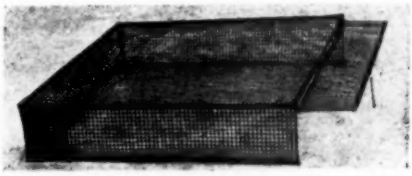
The trapping of birds and animals, without injuring them, has been a hobby of the writer since early boyhood. In 1912, when I received some vague information about bird banding, I trapped about twenty-five Bronzed Grackles and placed pigeon bands on their legs.

The next year I joined the American Bird Banding Association, but there were no available bands so we trapped another twenty-five Bronzed Grackles and banded them with colored celluloid rings.

When the first bands arrived in 1915, the instructions were to band only the nestlings, but the temptation was too great to wait until the nesting season and a few adults were trapped and banded. A suggestion was made to the Association that many adults could be trapped and banded; although a favorable answer was not received, we continued to trap and band adult birds. So it can be imagined how we felt when Mr. S. Prentiss Baldwin's message on systematic trapping arrived. It was like being released from bondage, and the making of traps was started at once.

When Prof. W. B. Barrows came to Waukegan, after the meeting of the American Ornithologists Union in 1922, to inspect the traps, he wished to buy some for the Michigan State College and in that way we were forced to make traps for sale. They still are for sale to those who have not the convenience to make them, but all bird banders are at full liberty to copy any of our traps for bird banding at any time. We hope to give enough measurements in the following article so that anyone can make his own traps; and we hope some one will be ingenious enough to show us how to make a better trap.

There is a way to trap any bird if one will study its foods and habits, but the degree of success may be limited.

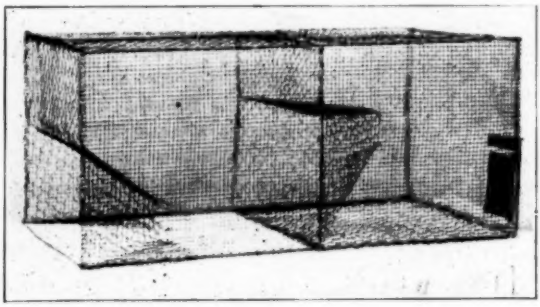


Begin the easiest way, trap only at convenient times. Most anyone can make a flat box-like trap similar to the illustration and raise one side with a stick as a prop and run the string to your window. Keep the ground underneath the trap always baited so when you are not around it becomes a permanent feeding station and the birds become accustomed to it, and eventually you will catch them. You will be surprised just what one small trap will catch with a little persistence, even if only worked at odd times. You can make the size or the shape to fit your window ledge, up in the tree, or on the ground, but the following size for on the ground is found very convenient.

Your material should be what is known as hardware cloth, No. 2 mesh, that is two and one-half meshes to the inch. No. 3 mesh may be used if desired.

Get the cloth three feet wide and six feet long, be sure they cut it square. Take one square, three feet each way, and fold over a double turn like a hem, make this hem one-half inch, this will stiffen the outside edge and do away with the sharp points. If you can find a No. 8 or No. 10 wire it should be placed in the edge where you expect to make the door. Cut the other three-foot piece into four nine-inch strips and fold double one-half inch hem all the way aruond the edges. In one of these make a door which should slide up and down. The opening should not be very large. In most of our traps we make it 5x5 inches. Then if you have to reach in it is just a convenient size for your arm, not leaving any extra space for the bird to escape. When your trap is made it is always best to paint it with some very thin paint. Any neutral color will do.

The next step is to make a carrying cage about 6x6x16 inches with a door 5x5 inches that slides up and down, so this door may be put against the door of the trap and the birds driven into the carrying cage for convenience in handling.

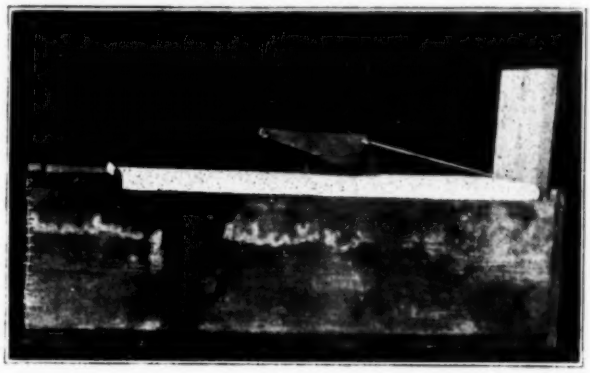


Our first traps were made on the pattern of the old government sparrow trap. We immediately found that the front funnels had such a slope that the birds were uncomfortable in resting on them and by making the funnel only half as high it seemed better By observing the birds when they were trapped it was noted that they immediately would fly to the top and gradually settle down to the most convenient perch. With the front funnel much lower this would put hem right in line to see the hole into the rear compartment, and by making the rear funnel perfectly flat on top it gave them a very convenient resting place up off the ground and they were more contented. The funnels and the top and bottom of this trap are made out of three-quarter-inch poultry netting, which is more or less hexagonal in shape and is less visible than the square mesh. The sides and back of the trap are made of No.3 hardware cloth and then there is the door in the rear compartment with the opening of 5x5 inches, with a door that slides up and down so the arm can be inserted to catch the birds.

We place a sheet-metal cover over the rear compartment, which protects the birds from rain, snow, or sun and also from cats, rats, hawks, dogs, etc. On many of the traps we bend the edge of the metal roof down over each side a few inches to act as a wind-break. Especially during the winter, we place a little perch up in this protected corner.

The most convenient size we have found to be 20 inches wide, 16 inches high and 36 inches long. It should be painted a dark neutral color to preserve the

wire and make it inconspicuous. This has been the most successful trap of any trap we have ever used in trapping over 15,000 birds.



The cat trap illustrated shows the most successful of a number that have been tried out. It is made of 1-inch lumber about 30 inches long, using two boards 8 inches wide and two 10 inches wide. When nailed together this will give you a hollow box 8x8 inches inside.

The guide strips are nailed to the front so an 8-inch rising and falling door will just fill the opening. If the guides are extended a little above the box it is found to be an advantage but in shipping they cause an extra rate and are often broken so they are left off.

The tripping device is made with a thin piece of board a little less than 8x8 inches with a half inch strip tacked under the center, so it acts like a teeter board. The triangle on top of the trap is made of wood or a good stiff piece of galvanized iron. The string is attached to the outer hole and a slight weight on the teeter board gives four times the pressure on the trigger.

The back of the trap is divided into an extra compartment by a partition of wire cloth, one-third or one-half inch mesh. This forms a bait chamber which can be entered only by a door on top of the trap; and is securely hooked shut. By putting the fish head in this compartment the cat can see and smell it very readily but there is no access to it. Anything caught in this trap is out of sight and can be easily carried to a convenient point of disposal.

Two or three of these traps count for twenty-five cats annually at our station.

There is a bird bander, a carpenter by trade, who makes these traps so they can be shipped from Waukegan at $4.00. That is only in case you are unable to make your own.

Many banding stations fail to attract birds on account of lack of shrubbery or other cover in which the birds can hide or make their escape. You can increase the number of birds by planting sunflower and hemp.

Hemp produces one of the best covers for birds, and also provides an enormous lot of food that stays up off the ground during the entire winter. One of our hemp plants reached the height of fourteen feet and was at least ten feet in diameter. The extra size of this plant may be attributed to the fertilizer that was in the ground underneath it, because this particular seed was planted upon

the grave of two cats. Try planting some hemp and sunflower around your trapping sites and along the fence lines.

Cardinals in Minnesota.—On November 11 last, Mrs. Commons saw a male Cardinal in our shrubbery and on the following day, November 12, captured a female in one of our traps and banded it (band No. 482843). Some fifty years ago the Cardinal was a rare bird in Minnesota but of recent years it has been gradually extending its range farther north, and having banded this one at our Tanager Hill station we were somewhat elated about it and were anxious to learn to what extent it had become a Minnesota bird. We requested Dr. Thomas S. Roberts, Director of the Zoological Museum, University of Minnesota, who is the best authority on the subject, to give us information about its occurrence in Minnesota, which he has kindly done and of which the following is an abstract:

Dr. Roberts states substantially that the first positive record in this state was a male bird shot by himself near Lake Harriet (Minneapolis) in October, 1875. A few were reported seen before and after this date, up to October, 1878. After this time the records became more frequent and from about 1911 they became permanent residents in the southeasterly part of the State, spreading gradually northward until now they are established and nesting as far north as Minneapolis. From Red Wing south they are now fairly common, remaining through the year and nesting in considerable numbers. The farthest north nesting record is at upper Lake Minnetonka (our locality). For a number of years the only records were in the fall, winter or early spring, and it was not until about 1911 that they became established as nesting birds.

Although there have been several reports of them in our Lake Minnetonka locality we, ourselves, had never seen one here before through many years of observation.

After banding the one referred to we became interested in learning the banding record of them in our state. In reply to a letter sent to the Bureau of Biological Survey we are in receipt of one from Mr. Lincoln in which he says that after examining their files they were unable to find records of any of these birds having been banded heretofore in this state, and that accordingly he feels satisfied that Mrs. Commons has the honor of banding the first Cardinal banded in Minnesota.—Frank W. Commons, *Minneapolis, Minn.*

Continuous Mating of Towhees.—As there is a question as to the time some birds retain their mates, the following experience with a pair of Towhees may be of interest.

On April 19, 1923, I banded a male Towhee with No. 46786. March 27, 1924, I caught him again and also his mate No. 46793. I was not as active in 1925, so I did not catch either of them that year. November 19, 1926 I again caught 46786 and his mate 46793. I found the band 46786 had worn very thin and I replaced it with a new one, so that this new number is 46817.

This year, April 27, I trapped 46817 again, and while I am sure she (46793) was with him, (you know I band on the "off side") I was not able to capture her. The record is sure, however, for at least three years, and probably it is safe to assume that their partnership is a life-time mating.—Dr. H. H. Hayes, *Hubbard Woods, Ill.*

Behavior of Chickadees.—On May 27, 1925, I caught and banded a Chickadee in my canary-cage trap. He did not seem frightened and I watched the trap closely for his return. The next day he came back, and every day for at least a week. One day I was surprised to see him come, and this time accompanied by his family of three little ones (I never saw the mother). He directed the little ones and had them in a row on the ledge outside of the cage; then he hopped in and proceeded to feed the babies through the bars of the cage. One little fellow slipped around the cage and jumped up in the door, but the father saw him and flew to the door and pecked the baby and made them all stay out of the trap. He returned for four days, and each day the same performance took place; but never once could I catch one of the little ones and of course I did not try to trap the father again.

Each year he comes back for I can see the band through my binoculars, but I have been unable to catch him again.—Mrs. M. L. Coutant, *Danville, Illinois.*

An Albino Purple Martin.—A white Purple Martin was born, raised, and went on his migration from one of our martin houses. I tried my best to trap him but, on the two occasions when he entered the house, he "gave me the slip." I hope he will return next year. This bird was also seen among the martins at DeTour. Of the forty Purple Finches banded in 1926, nineteen returned in 1927. —Geo. W. Luther, *DeTour, Michigan.*

Catbirds Remain Mated.—Catbirds, Nos. 146857 and 146858, which were banded as a mated pair on June 6, 1926, and July 11, 1926, were retrapped, still mated, at their nest within five feet of both 1926 nests on June 24, 1927, at Riverside Park.—S. E. Perkins III, *Indianapolis, Indiana.*

Notes

In the Massachusetts Items of Interest, February 1, 1928, Mr. Forbush writes: "We hope that bird banders will take pains to record the colors of the bill, eyes, legs, and feet of the birds that they band. There is so much confusion in various publications regarding the colors of these parts of small birds, as well as large birds, that a systematic effort should be made to record the colors from *the living birds in the hand.* Many notes on the colors of the bills and feet of birds have been taken from dried skins in which the colors are often quite different from those of the living bird.

"These colors change more or less according to age and season. In recording them it is well to state whether the bird is an adult or young, and to give the *date* of the record."

The Inland Bird Banding Association will appreciate any efforts to carry out Mr. Forbush's suggestions.

COMMUNICATIONS

Editor, Wilson Bulletin: Mrs. Taylor's paper on Alexander Wilson, appearing in the June (1928) issue of the Bulletin, contains what I believe to be an erroneous statement which, though of minor consequence, should, to guard against repetition, be spoken of. Mrs. Taylor says of the American Ornithology that "Volume I contains two plates colored by Wilson's own hand."

It is indeed true that by his own hand Wilson etched two plates which eventually became plates 1 and 2 of his published work; and it is true that when he had etched the plates he took prints, colored them, and sent them to his friend William Bartram. He did this in the first enthusiasm of the idea of his great work. But at once he perceived that zeal alone was not enough; he saw that professional aid was necessary, and he had no money with which to buy professional aid; and so he laid the matter aside.

A few months later the publisher, William Bradbury, undertook to finance the project, and that changed the situation. Alexander Lawson, a master engraver, was employed; Wilson's two plates were brought out; Lawson took them in hand, retouched them, and put them in the condition in which they at length were used in the published work.

Wilson meanwhile, with zeal rekindled, devoted his spare hours to collecting, to writing, and to the soliciting of subscriptions. Eventually four hundred and forty subscribers were enrolled.

The production of a book of the size intended (nine volumes, small folio, with eighty plates, more or less) and in an edition of upwards of five hundred copies necessitated a staff of trained workmen. In that day the hand coloring of engravings was a common practice, and shops of colorists were maintained by publishers. Miss Lawson alludes[1] to the fact that Wilson eventually employed Alexander Riter in that capacity. The data in the light of which Mrs. Taylor's statement should be revised are contained in a letter which on the 22nd of May, 1807, Wilson wrote to William Bartram. The important passages are as follows:

"By the impressions of my two first plates that accompany this you will see that I have a request to make to Miss Bartram if the state of her health will permit. We want well coloured specimens of the plates to be sent to Boston, Charleston, New York, &c., and as my time will not permit me to do them myself I have presumed to apply to her to colour the impressions that are sent with this according to the specimens that accompany them, for which I shall make any return. Perhaps Mary Leech might be set to some parts of them with safety which would lessen the drudgery. . . .

"In washing the blue Jay the most difficult part of the process is to lay on the colour without being streaked (which you will see I have not succeeded in) and in giving the true tint which I think is nearly approached in the specimen. Nothing but a wash is necessary as the engraving must be seen thro the colour.

"But you know the whole affair ten times better than I can pretend to and as I shall be engaged in Drawing on Sunday I beg you would drop me a line tomorrow by Mr. Leech. . . .

"P. S. The yellow bird has been coloured with a too dull yellow and the *breast* of the hanging bird may be more of a vermillion."[2]

Wilson did color a few prints of his first two plates: but it is quite plain that he did not color the several hundred prints of them which were involved in publication.

Sewickley, Pa. BAYARD H. CHRISTY.

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[1] "Miss Lawson's recollections of ornithologists." By Frank L. Burns. *Auk*, XXXIV. No. 3, July, 1917, pp. 275-282 (p. 279).

[2] "Some unpublished letters of Alexander Wilson and John Abbott." By Witmer Stone. *Auk*, XXIII, No. 4, October, 1906, pp. 361-368.

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